PB82-148156

Highway Construction Noise Field Measurements
Site 2: 1-205 (Oregon) (Appendix B)

Wyle Labs./Wyle Research
Arlington, VA

Prepared for

Environmental Protection Agency
Washington, DC

Oct 81

U.S. Department of Commerce
National Technical Information Service
NTIS

PB82-148156

APPENDIX B

HIGHWAY CONSTRUCTION NOISE FIELD MEASUREMENTS, SITE 2: I-205 (OREGON)

October 1981

Office of Noise Abatement & Control
U. S. Environmental Protection Agency
Washington, D. C. 20460

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Completed under an Interagency Agreement jointly sponsored by both EPA (Office of Noise Abatement and Control) and FHWA.

16. ABSTRACT

This study investigated the noise associated with highway construction activities. It involved the identification and examination of: highway construction activities, noise characteristics associated with highway construction activities, availability of highway construction noise abatement measures, demonstration of construction site noise abatement measures, and development of a computer-based model for use as a tool to predict the noise impact of construction activities and to plan mitigation measures. The model was developed for use on the FHWA computer (IBM 360).

A total of seven reports were prepared in this study and have been released for public distribution.

Reports (Part D through Part G) contain field data gathered at the field demonstrations at highway construction sites in: Route I-201, California; I-205, Oregon; I-95/I-395, Maryland; and I-75, Florida. They contain noise data on single and multiple pieces of equipment, provide general description of highway site activities, and activity analyses of equipment.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Highway Noise Construction Equipment Noise Measurements Construction Noise Noise Abatement		

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APPENDIX B

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October 1981

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U. S. Environmental Protection Agency
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2

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FORWARD

This study was jointly sponsored, through an Interagency Agreement (IAG), by the Office of Noise Abatement and Control (ONAC), U.S. Environmental Protection Agency (EPA), and the Federal Highway Administration (FHWA), U.S. Department of Transportation (DOT). The study was conducted by Wyle Laboratories under contract to FHWA Contract No. DOT-FH-11-9455. Wyle Research of El Segundo, California, and Wyle Research of Arlington, Virginia, performed the study.

The object of the study was to investigate and study the noise associated with highway construction activities. The study involved the identification and examination of: highway construction activities, noise characteristics associated with highway construction activities, availability of highway construction noise abatement measures, demonstration of construction site noise abatement measures, and development of a computer-based model for use as a tool to predict the noise impact of construction activities and to plan mitigation measures. The model was developed for use on the FHWA computer (IBM 360).

The principal project officers for Wyle Laboratories on this project were Mr. William Fuller of Wyle Research in El Segundo and Dr. Kenneth Plotkin of Wyle Research of Arlington, Virginia.

The government project managers for the study were Mr. Fred Romano of FHWA, and Mr. Roger Heymann of EPA/ONAC.

The various technical reports completed by Wyle under this contract and submitted to FHWA have been released for public distribution by EPA.

PREFACE

This study involved a comprehensive review of the environmental noise associated with highway construction activities. A total of seven reports have been released for public distribution. These reports are:

1. Analysis and Abatement of Highway Construction Noise, EPA 550/9-81-314-A, September 1981.
2. A Model for the Prediction of Highway Construction Noise, EPA 550/9-81-314-B, September 1981.
3. IBM 360/System Batch Version of Highway Construction Noise Model, EPA 550/9-81-314-C, September 1981.
4. Appendix A, Highway Construction Noise Field Measurements, Site 1: I-201 (California), EPA 550/9-81-314-D, September 1981.
5. Appendix B, Highway Construction Noise Field Measurements, Site 2: I-205 (Oregon), EPA 550/9-81-314-E, September 1981.
6. Appendix C, Highway Construction Noise Field Measurements, Site 3: I-95/I-395 (Maryland), EPA 550/9-81-314-F, September 1981.
7. Appendix D, Highway Construction Noise Field Measurements, Site 4: I-75 (Florida), EPA 550/9-81-314-G, September 1981.

The first two reports (Part A and Part B) might be considered the principal reports since they are relatively self-contained units on this study's efforts, the engineering studies and the computer model, respectively. In this regard, if there is to be a limited purchase of the reports, one might consider obtaining either or both of Part A and Part B, and obtaining the other reports as additional informational needs arise.

- The first report (Part A) contains all of the information from the engineering study phase of the project. It gives information on highway construction procedures, highway construction site noise characteristics, available abatement measures, and results from field demonstrations on noise abatement.

- The second report (Part B) presents a complete description of the highway noise prediction model. The report contains a description of the model's formulation and construction, a description of the program, and a user's manual.
- The third report (Part C) provides additional information to the Part B report on the highway construction noise model installed at DOT's Transportation Computer Center on an IBM 360 computer. It delineates the differences between the version of the model as installed on the IBM 360 and the two models (HINPUT and HICNOM) operating on the Wyle Computer (PDP-11). The report has additional user's manual information for use on the IBM 360, a programmer's manual describing changes in going from the PDP-11 to the IBM 360, and a maintenance manual.
- Reports 4, 5, 6, and 7 (Part D through Part G) contain field data gathered at the field demonstrations at highway construction sites in: Route I-201, California; I-205, Oregon; I-95/I-395, Maryland; and I-75, Florida. They contain noise data on single and multiple pieces of equipment, provide general description of highway site activities, and activity analyses of equipment.

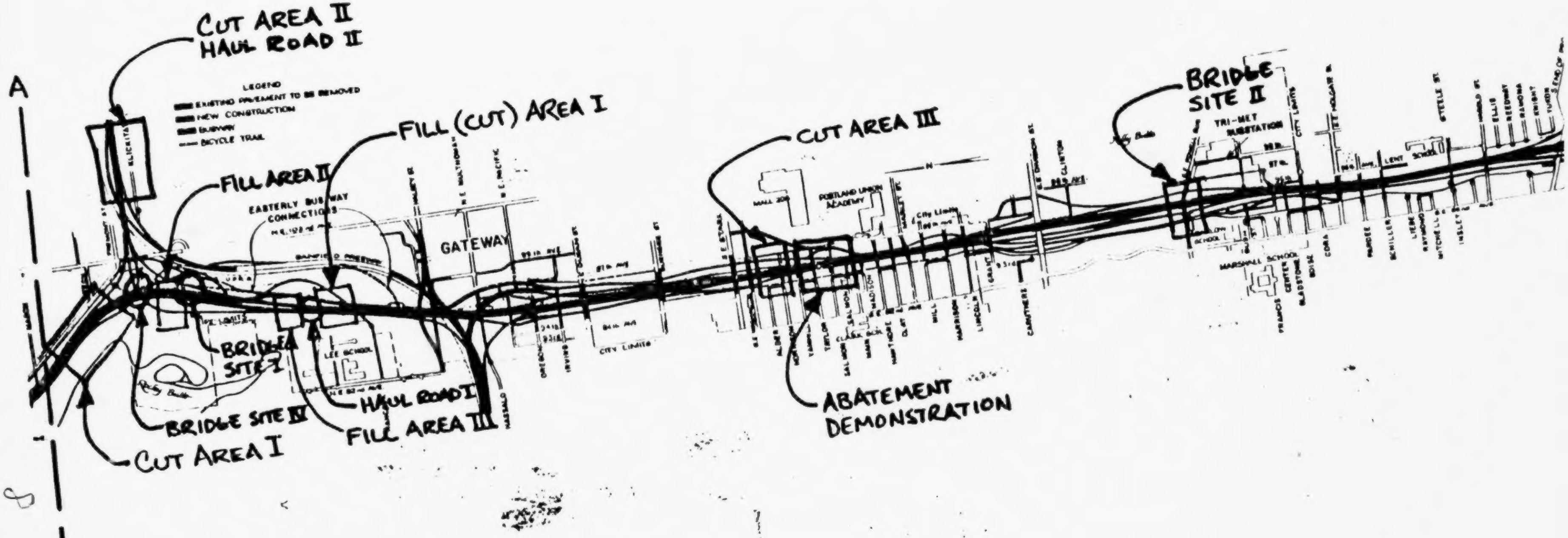
APPENDIX B

This appendix summarizes field measurements performed at the I-205 (Oregon) construction site during September 1979. This site consisted of 9 miles of 6-lane divided highway being constructed on new alignment. The site topography was generally flat to gently rolling with some hilly canyon terrain. The highway cut through an urban area characterized by single-family dwellings, schools, small stores, etc. Further description of this site is presented in Section 3.5 of the main report.

The following data and information are presented in this appendix:

1. General highway site description.
2. Noise measurements of activities involving single or multiple pieces of equipment; diagrams describing each activity site are included.
3. Controlled single equipment noise measurements of selected equipment.
4. Equipment activity analysis of selected equipment.

A summary of key construction noise data derived from this site is presented in Section 3.5.3 of the main report.


CUT AREA II
HAUL ROAD II
LEGEND
EXISTING PAVEMENT TO BE REMOVED
NEW CONSTRUCTION
BUSWAY
BICYCLE TRAIL
FILL AREA II
EASTERLY BUSWAY CONNECTIONS
FILL (CUT) AREA I
GATEWAY
BRIDGE SITE I
LEE SCHOOL
HAUL ROAD I
BRIDGE SITE IV
FILL AREA III
CUT AREA I
CUT AREA III
PORTLAND UNION ACADEMY
MALL 205
CITY LIMITS
ABATEMENT DEMONSTRATION
BRIDGE SITE II
TRI-MET SUBSTATION
MARSHALL SCHOOL
A
A

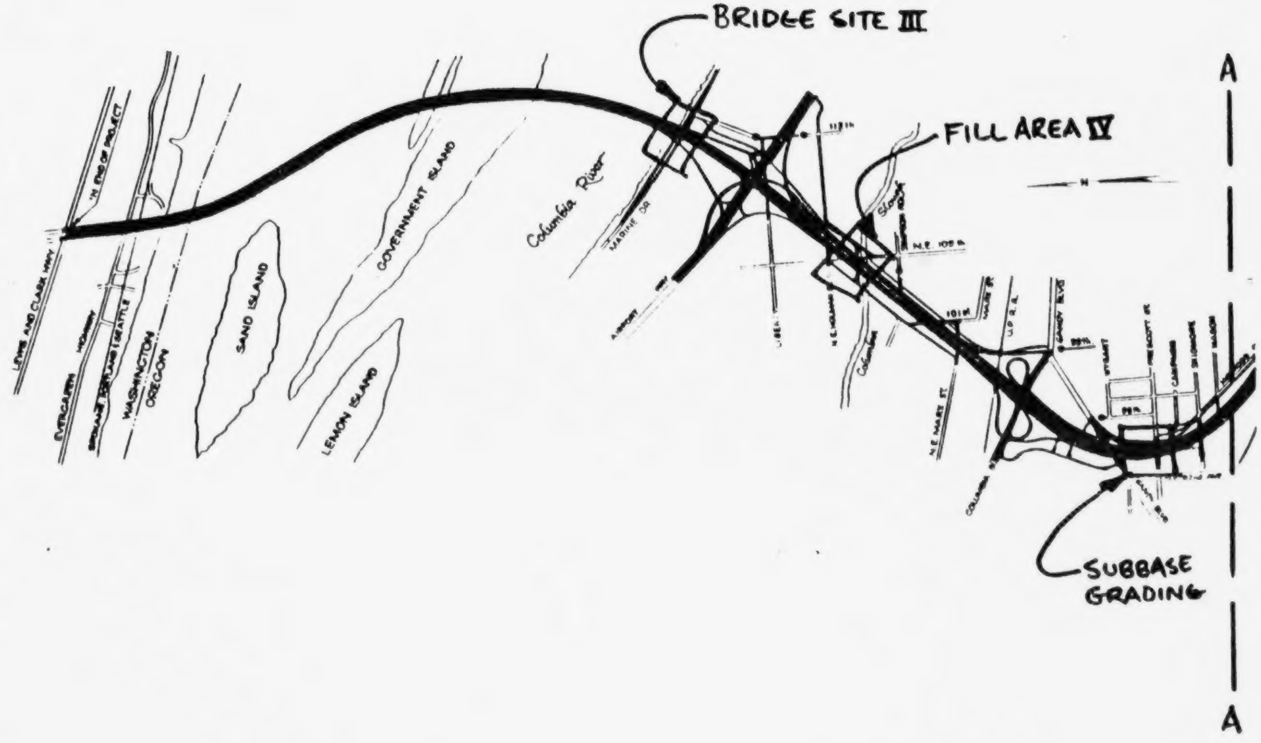
ORGOON DEPARTMENT OF TRANSPORTATION

INFORMATIONAL MAP

INTERSTATE 205-EAST PORTLAND FREEWAY

LEWIS & CLARK HWY. - FOSTER RD. SECTION

SCALE: 1" - 1600'


BRIDGE SITE III
FILL AREA IV
SUBBASE GRADING
A
A
N
Columbia River
MARINE DR
AIRPORT WAY
LIBERTY
N.E. HOLMAN
Columbia Slough
N.E. 109th
N.E. MARX ST
101st
MAIN ST
U.P. R.R.
SANDY BLVD
COLUMBIA BLVD
STUART
PRESCOTT ST
GOVERNMENT ISLAND
SAND ISLAND
LEMON ISLAND
WASHINGTON
OREGON
N END OF PROJECT
LEWIS AND CLARK HWY
EVERGREEN HIGHWAY
SPOKANE PORTLAND & SEATTLE

Measurement Site Data

Highway: I-205

Date: SEPT. 1979

Site Location: Cut Area I @ the Fairfield Frwy. Interchange

Type of Measurements:

☑ Community ☑ Activity ☐ Propagation

☑ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Steep rocky slope bordering west side; concrete retaining wall & earth berm borders east side; multi-level terrain; large rock & loose soil. All site boundary measurements made along east side on top of earth berm.

Machinery Description:
Cat. D9G Dozer
Cat. D8H Dozer
Cat. 96C Dozer
FMC Link-Belt LS 4000 Backhoe
Rock Drill (pneumatic) w/ Gardner-Denver 750 CFM Comp.
Fiat-Allis 460 Scraper (only operating on 9-8-79)

Miscellaneous Information:

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Cut Area I

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45 - 3	C-2	9-5	1425	:15m	9-5D	CUT AREA; EAST SITE BOUNDARY	
- 4	C-2	9-5	1540	–	9-5D	CUT AREA; ROCK BLASTING	
-5	C-4	9-5	1615	:15	9-5D 9-5E	CUT AREA; TRENCHING & PIPELAYING; MICROPHONE LOCATED 30 FEET ABOVE BACKHOE	✓
-16	C-5	9-7	0915	:10	9-7C	CUT AREA; TRENCHING & PIPELAYING; MICROPHONE LOCATED AT GRADE WITH BACKHOE	✓
158-1	C-3	9-5	1500	1:48	9-5D	COMMUNITY MEASUREMENT; S.E. CORNER OF HAYWOOD & BEECH.	✓
158-2	C-3	9-6	1315	18:45	9-5D	SAME AS #158-1; RECORDER ON OVERNITE	✓
158-4	C-6	9-8	0915	4:00	9-8B	COMMUNITY MEASUREMENT; 1/2 BLK. EAST OF SITE, ON ALTON ST.	✓
178-1	C-1	9-5	0810	1:40	9-5D	SITE BOUNDARY; TURNED OFF DUE TO RAIN	✓
177-2	C-1	9-5	1410	2:40	9-5D	SITE BOUNDARY; LOCATED ON TOP OF EARTH BERM	✓
177-5	C-1	9-8	0850		9-8A	SITE BOUNDARY; AT TOP OF BERM	✓

SITE BOUNDARY/COMMUNITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Cut Area

Sample	Location	Date	Dur.	L_{eq}
178-1	C-1	9-5	1:40	77.7
177-2	C-1	9-5	2:40	75.6
177-5	C-1	9-8	10:00	80.1
158-1	C-3	9-5	1:48	61.5
158-2	C-3	9-6	18:45	60.8
158-4	C-6	9-8	4:00	59.7

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Cut Area I

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-3*	C-2	9-5	:15	73	70	71	73	75	77
-4	C-2	9-5							
-5	C-4	9-5	:15	80.5	71	78	80	83	85
-16	C-5	9-7	:10	88.4	85	86	88	90	91

*Recorded just before blast, with equipment moving away from

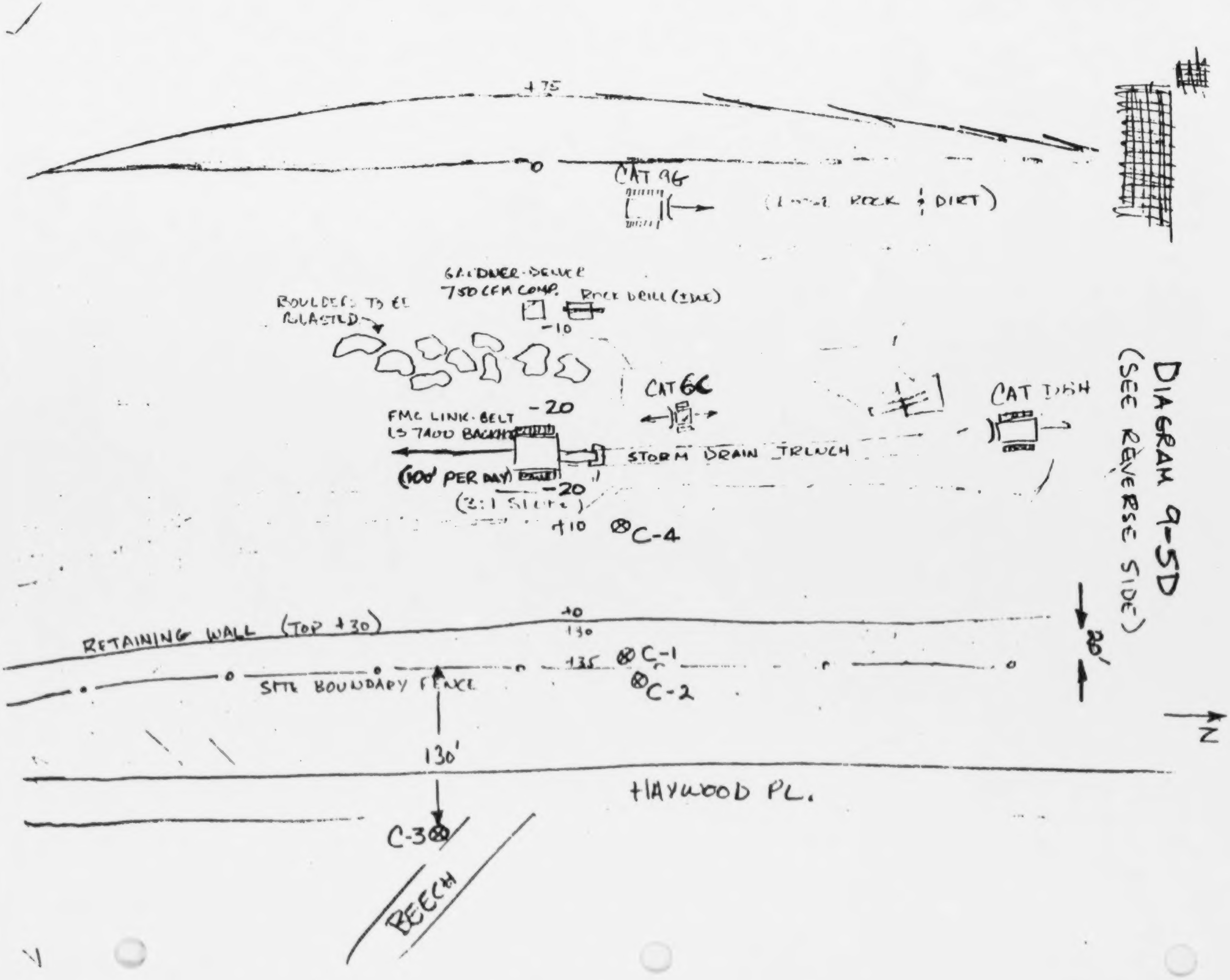

+75
CAT 9G
([illegible] ROCK & DIRT)
GARDNER-DENVER
750 CFM COMP.
ROCK DRILL (±[illegible])
-10
BOULDERS TO BE BLASTED
CAT 6C
CAT D8H
-20
FMC LINK-BELT
LS 7400 BACKHOE
(100' PER DAY)
-20
(2:1 SLOPE)
STORM DRAIN TRENCH
+10
C-4
RETAINING WALL (TOP +30)
+0
130
135
C-1
C-2
SITE BOUNDARY FENCE
20'
N
130'
HAYWOOD PL.
C-3
BEECH

DIAGRAM 9-5D
(SEE REVERSE SIDE)

DIAGRAM 9-5E

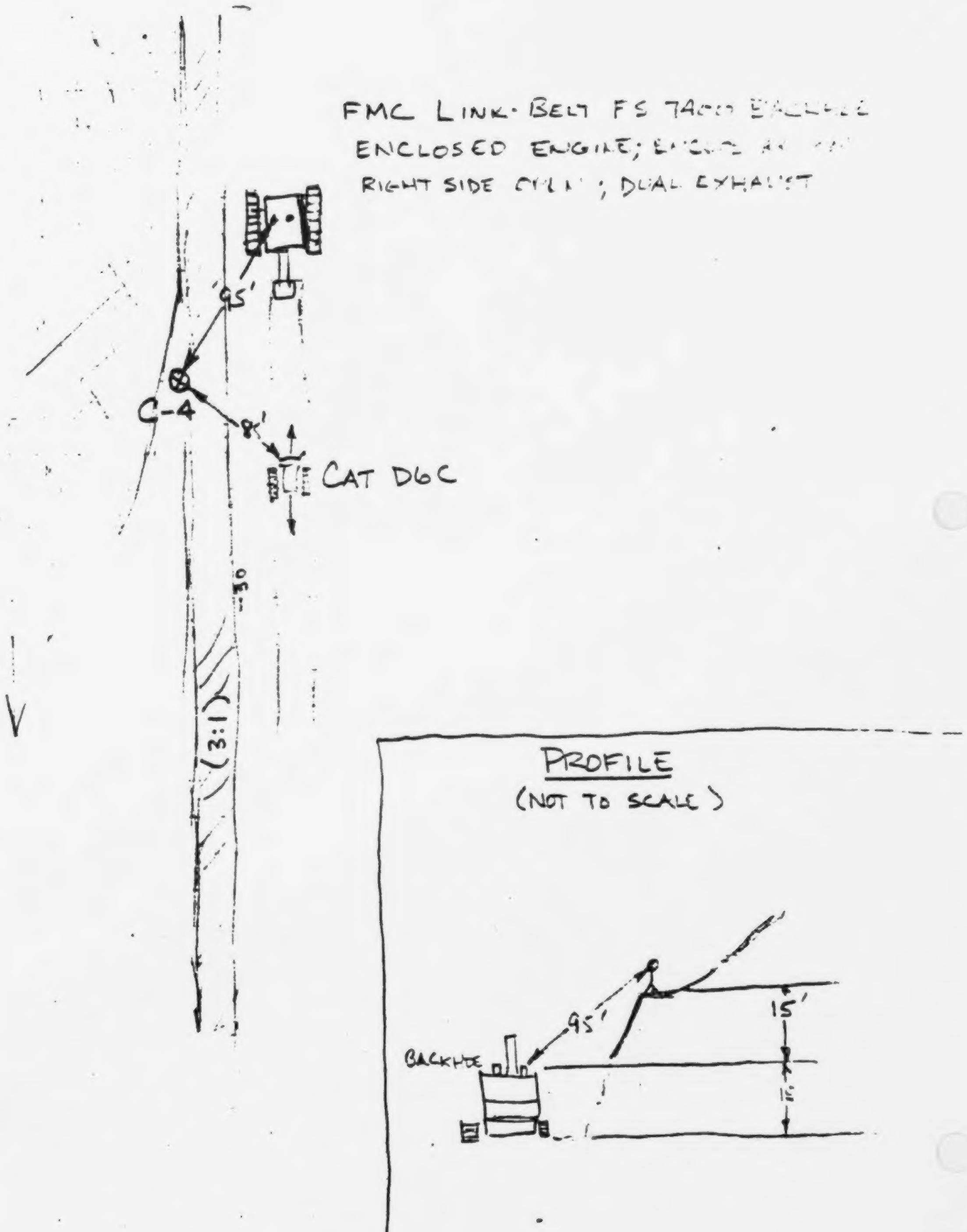

FMC LINK-BELT FS 7400 BACKHOE
ENCLOSED ENGINE; ENGINE [illegible]
RIGHT SIDE [illegible]; DUAL EXHAUST
95'
C-4
8'
CAT D6C
30
(3:1)
PROFILE
(NOT TO SCALE)
95'
BACKHOE
15'
15'

DIAGRAM 9-7C

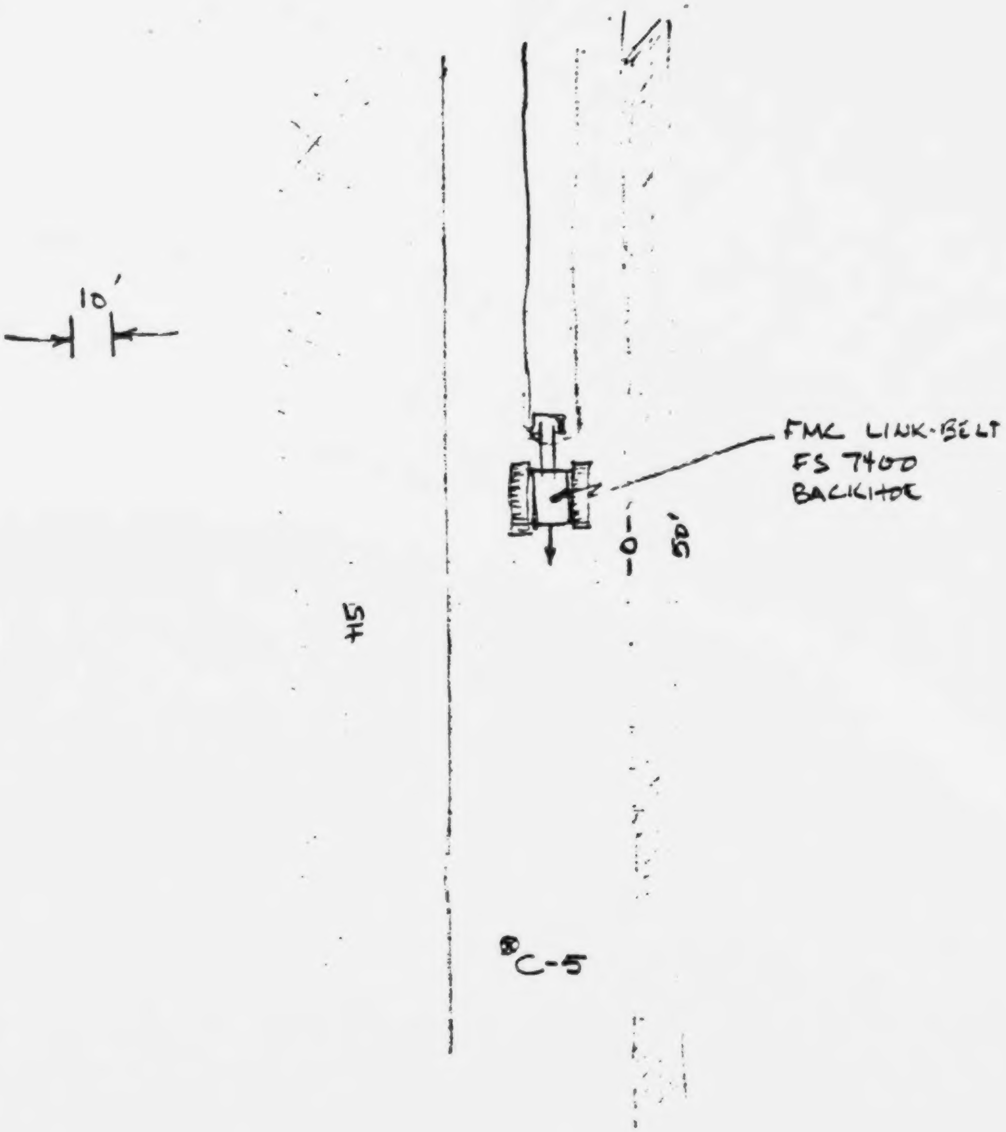

10'
FMC LINK-BELT
FS 7400
BACKHOE
30'
45'
C-5

DIAGRAM 9-8A

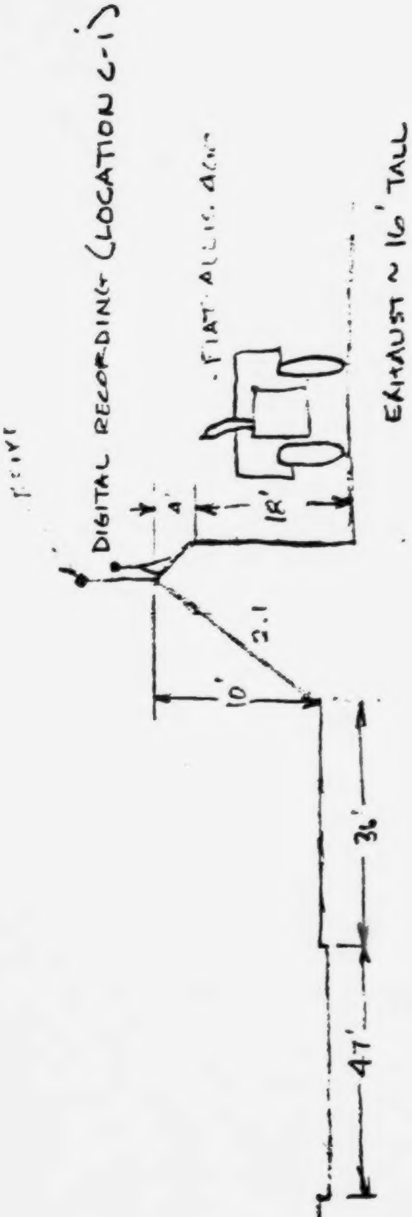
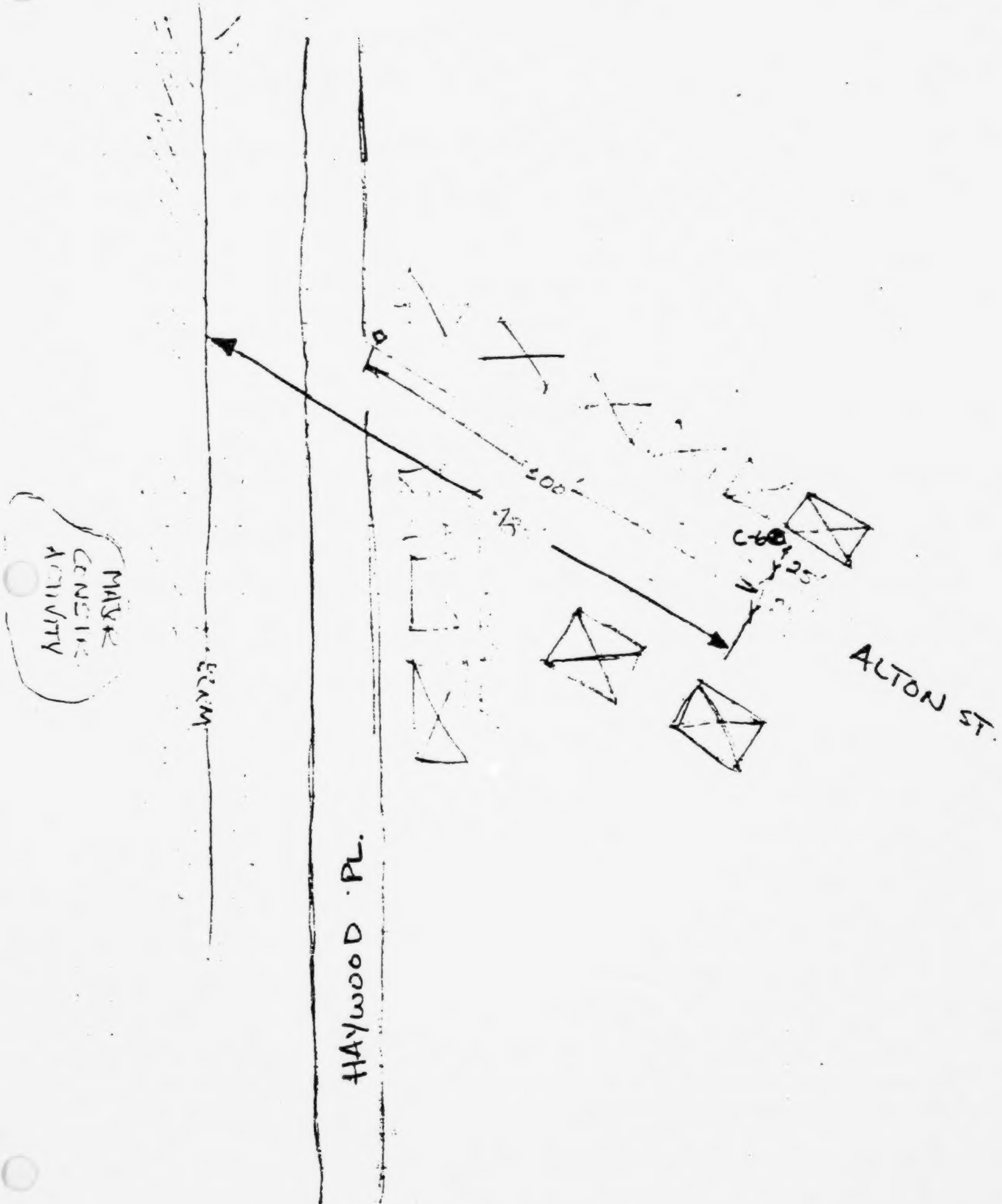

DIGITAL RECORDING (LOCATION C-1)
FIAT ALLIS
EXHAUST ≈ 16' TALL
4'
18'
2.1
10'
36'
47'

DIAGRAM 9-8B


MAJOR CONSTR ACTIVITY
BEAM
200'
75'
C-60
25'
ALTON ST.
HAYWOOD PL.

Measurement Site Data

Highway: I - 205 Date: Sept 1979

Site Location: Cut Area II; East of Interchange on Transition Road to Banfield Frwy.

Type of Measurements:

☑ Community ☐ Activity ☐ Propagation

☑ Site Boundary ☐ Single Equipment ☑ Movies

Soil/Terrain Conditions: Embankment between microphone & equipment was hard, compacted soil with 2:1 slope. Area around equipment was hard bank earth. Line of sight from mic. to equipment. Mic. approximately 25 feet above equipment.

Machinery Description:
Cat D9G Dozer
Cat D8H Dozer
Fiat Allis 460 Scrapers

Miscellaneous Information: Dozers worked in tandem pushing scrapers as they filled

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Cut Area II

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-13	C-7	9-6	0800	3	9-7A	w/MOVIES; ACTIVITY MEASUREMENT	✓
-14	C-8	9-6	0805	9	9-7A	SAME AS #45-13	✓
177-4	C-9	9-7	0745	9:15	9-7A	SITE BOUNDARY MEASUREMENT; NO LINE OF SIGHT FROM MIC. TO EQUIPMENT	N/G
158-3	C-10	9-7	0830	8:30	9-7A	COMMUNITY MEASUREMENT; ONE BLOCK SOUTH OF SITE ON FARGO ST.	✓

SITE BOUNDARY/COMMUNITY NOISE MEASUREMENTS

HIGHWAY: I-205　　DATE: Sept. 1979

SITE LOCATION: Cut Area II

Sample	Location	Date	Dur.	L_{eq}
177-4	C-9	9-7	9:15	N/G
158-3	C-10	9-7	8:30	57.5

ACTIVITY NOISE MEASUREMENTS

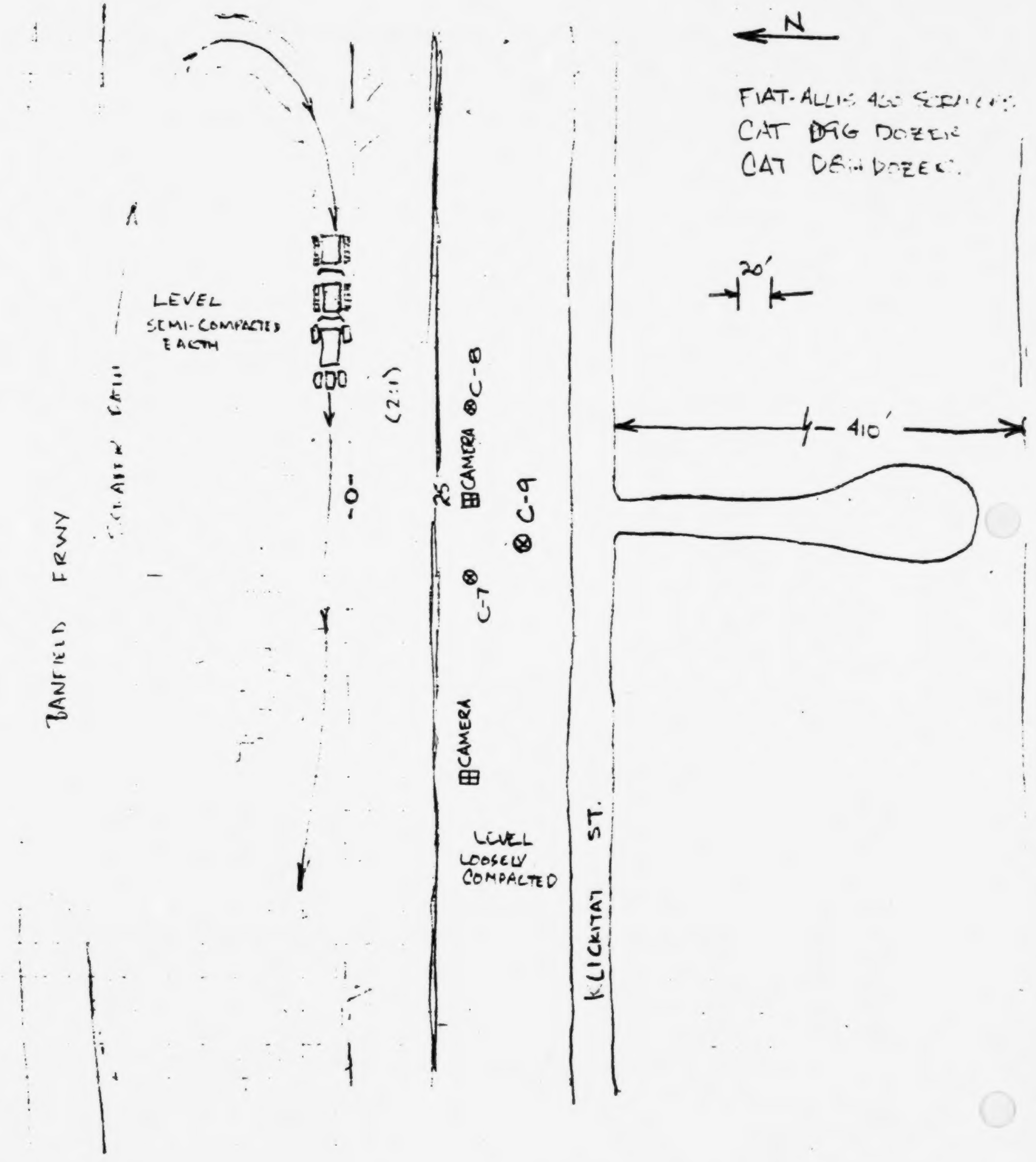
HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Cut Area II

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-13	C-7	9-6	3	80.1	69	74	79	84	85
-14	C-8	9-6	9	85.7	70	75	81	89	91

DIAGRAM 9-7A


N
FIAT-ALLIS 4.. SCRAPERS
CAT D9G DOZER
CAT D8H DOZER
20′
410′
LEVEL
SEMI-COMPACTED
EARTH
(2:1)
-0-
25
CAMERA
C-8
C-9
C-7
CAMERA
LEVEL
LOOSELY
COMPACTED
KLICKITAT ST.
BANFIELD FRWY

Measurement Site Data

Highway: I-205 Date: Sept 1979

Site Location: Cut area III; S. of Washington St.

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Terrain is generally flat. Area from microphone to cut operation was flat and grass covered. Area where equipment worked was depressed by about 5 feet.

Machinery Description:
Cat. D9G Dozer
Cat. D8H Dozer
Cat. 631 Scraper

Miscellaneous Information:
Dozers worked in tandem pushing scrapers

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Cut Area III

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-24	C-11	9-7	1615	15	9-75	ACTIVITY MEASUREMENT	✓

ACTIVITY NOISE MEASUREMENTS

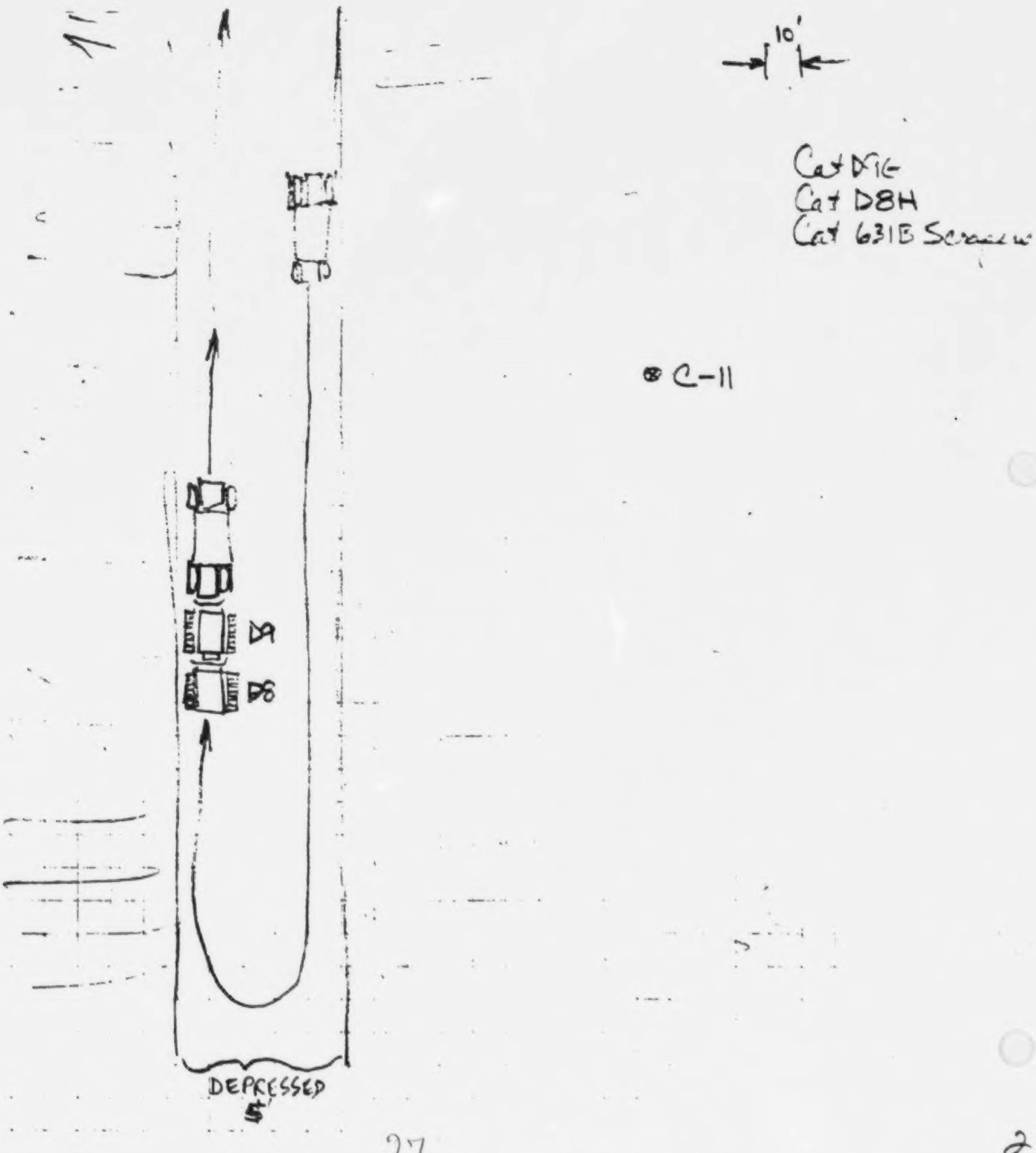
HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Cut Area III

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
AS-24	C-11	9-7	5	86.0	78	80	84	90	92

DIAGRAM 9-TS


10'
Cat D9G
Cat D8H
Cat 631B Scraper
C-11
D9
D8
DEPRESSED
5'

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Fill (Cut) Area I; S. of interchange

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☑ Site Boundary ☐ Single Equipment ☑ Movies

Soil/Terrain Conditions: Steep rocky slope along western side of sight. Hard compacted earth at bottom of slope, representing highway right-of-way. Eastern edge of right-of-way slopes off sharply.

Machinery Description:

Fiat - Allis 460 Scrapers (during 9-5-79 measurements only)
Compactor (no name; during 9-5-79 measurements only)
Cat D9G Dozer
2 Cat D8H Dozers
Cat 988 Loader
2 Cat. 769 End Dumps

Miscellaneous Information:

Scrapers brought in fill soil; operated only on 9-5-79
Cat. 769 End Dumps used to carry heavy rocks; loaded by Cat. 988 loader.

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Fill (Cut) Area I

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-6	F-2	9-6	0900		9-6A	W/MOVIES; CUT ACTIVITY. MICROPHONE LOCATED ABOVE EQUIPMENT.	N/G
-9	F-3	9-6	1040	:14	9-6A	CUT ACTIVITY; AT GRADE WITH LOADING OPERATION.	✓
177-1	F-1	9-5	0848	1:09	9-5B	SITE BOUNDARY; CUT & FILL OPERATIONS; MIC. LOCATED ABOVE EQUIP. - RAINING	✓
-3	F-1	9-6	0815	7:48	9-6A	SAME AS #177-1	N/G

SITE BOUNDARY/COMMUNITY NOISE MEASUREMENTS

HIGHWAY: I-205 DATE: Sept 1979

SITE LOCATION: Fill (Cut) Area I

Sample	Location	Date	Dur.	L_{eq}
177-1	F-1	9-5	1:09	80.7
177-3	F-1	9-6	7:48	N/G

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Fill (Cut) Area I

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_{1}
45-9	F-1	9-6	:14	94.4	84	88	94	97	99

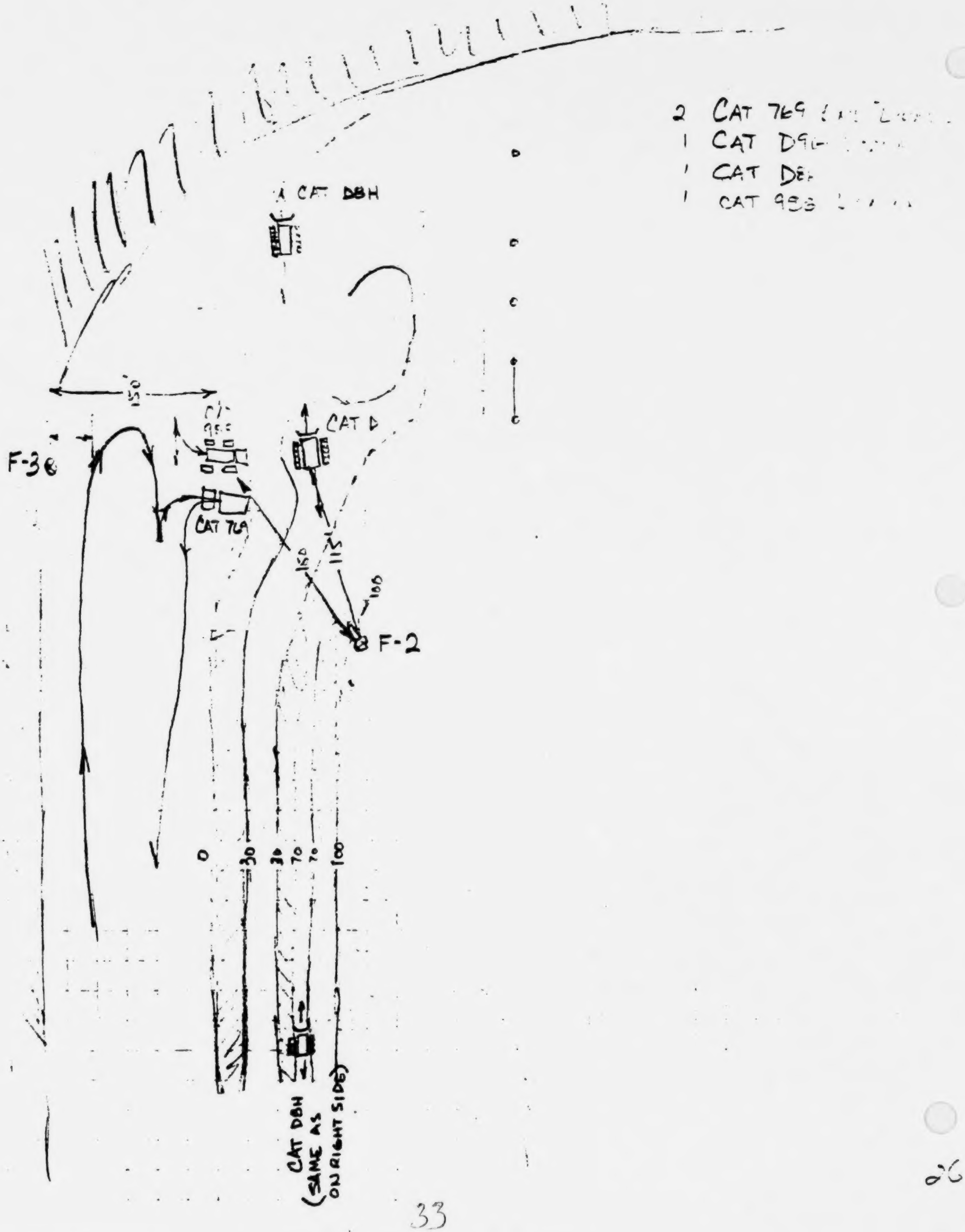
DIAGRAM 9-5B

WYLE LABORATORIES - Wyle Research, El Segundo, California Page ____ of ____

Prepared by:____________________ Date:________ Subject:____________

(SEE REVERSE SIDE)

DIAGRAM 9-6A


2 CAT 769 [illegible]
1 CAT D9L [illegible]
1 CAT D8
1 CAT 988 [illegible]
CAT D8H
150'
CAT 988
CAT D
F-38
CAT 769
150
115
100
F-2
0
30
30
70
70
100
CAT D8H (SAME AS ON RIGHT SIDE)

Measurement Site Data

Highway: I-205 Date: Sept 1979

Site Location: Fill Area II; just S. of interchange

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Area between microphone (F-4) and scraper unloading area was level, loosely compacted soil. Large ravine between microphones. Second microphone (F-5) located on loosely compacted embankment, 5 feet below level of haul road.

Machinery Description:

Fiat-Allis 460 Scrapers
Cat. Dozer (type not identified)

Miscellaneous Information:

Dozer did not aid scrapers during unloading

DATA LOG SUMMARY

HIGHWAY: I- 205

SITE LOCATION: Fill Area II

DATE: Sept. 1979

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-7	F-4	9-6	0940	:22	9-6B	CH. 1; NEAR AREA WHERE SCRAPERS UNLOADED	✓
-7	F-5	9-6	0940	:22	9-6B	CH. 2; ACROSS RAVINE, NEAR HAUL ROAD	✓

ACTIVITY NOISE MEASUREMENTS

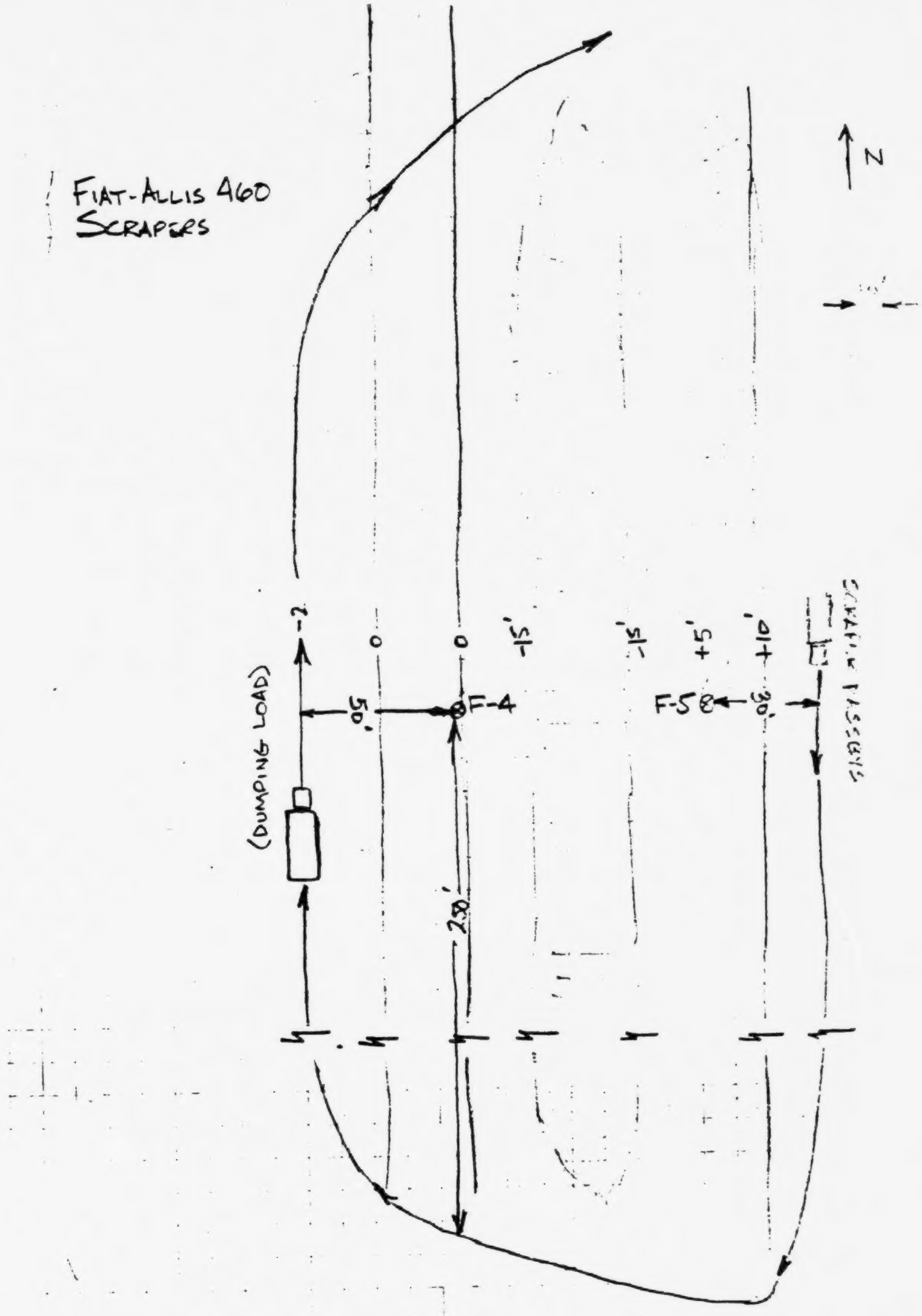
HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Fill Area II

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-7	F-4	9-6	:22	83	58	63	73	86	96
45-7	F-5	9-6	:22	79	59	64	75	83	89

DIAGRAM 9-6B


FIAT-ALLIS 460
SCRAPERS
N
(DUMPING LOAD)
-2
0
0
-15'
-15'
+5'
+10'
50'
F-4
F-5
30'
250'
SCRAPER PASSES

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Fill Area III - S. of interchange, between Fill Areas I & II

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Right-of-way area was flat, compacted earth. Soil was very wet due to rain the previous day. Embankment was steep slope covered with large boulders.

Machinery Description:

Cat 769 End Dumps with exhaust built into truck bed.

Cat. D8H Dozer

Miscellaneous Information: End dumps were unloading rocks hauled from Fill Area I. Trucks would unload onto the embankment; dozer would push excess rock over the embankment. Activity occurred along a portion of the right-of-way for which earthwork appeared complete

DATA LOG SUMMARY

HIGHWAY: I-205 DATE: Sept. 1979

SITE LOCATION: Fill Area III

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-8	F-6	9-6	1030	.09	9-6C	END DUMPS UNLOADING ROCK	✓

ACTIVITY NOISE MEASUREMENTS

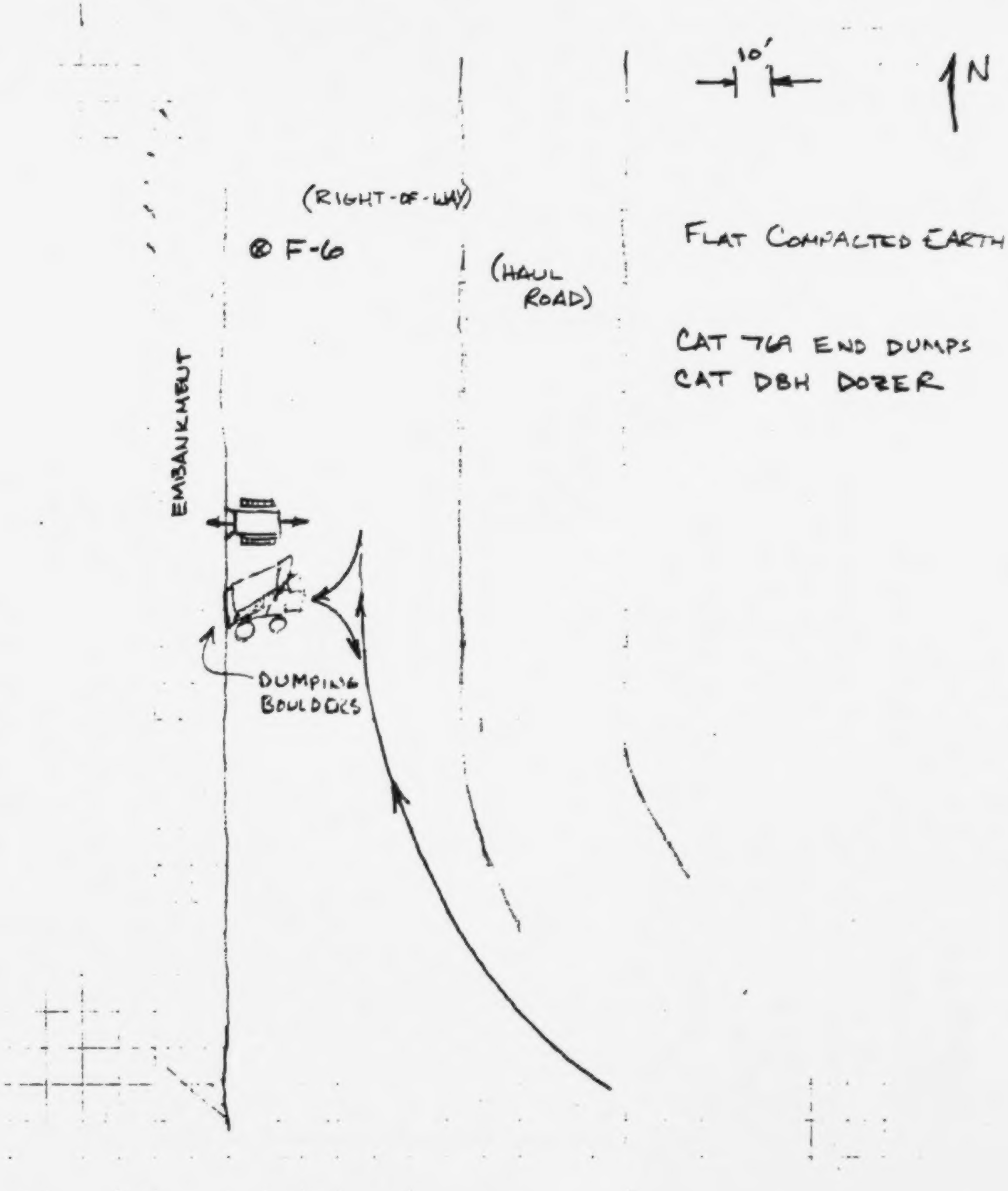
HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Fill Area III

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-8	F-6	9-6	:09	83.4	72	75	82	87	90

DIAGRAM 9-6C


10'
N
(RIGHT-OF-WAY)
⊗ F-6
(HAUL ROAD)
FLAT COMPACTED EARTH
CAT 769 END DUMPS
CAT D8H DOZER
EMBANKMENT
DUMPING BOULDERS

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Fill Area IV; northern section of project, near 105th St.

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: All equipment working in loosely compacted soil. Embankment in Diagram 9-76 is hard, compacted soil, approximately 25' high (represents termination of raised right-of-way). Area where equipment is working in Diagram 9-76 will be cross street.

Machinery Description:

2 Cat D8K Dozer
Cat 623 Scraper w/ elevator
Cat. 988 Loader
Motor Grader (type unknown)

Miscellaneous Information: Loader would move forward across bridge, load, then reverse back across bridge to unloading area shown in Diagram 9-76

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Fill Area IV

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-21	F-7	9-7	1330	12	9-7G	DOZER, SCRAPER LOADER, GRADER; DOZER ON TOP OF EMBANKMENT, NORTH OF MIC.	✓
-22	F-8	9-7	1420	8	9-7H	DOZER, LOADER.	✓

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Fill Area IV

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-21	F-7	9-7	12	76.0	67	71	75	79	80
-22	F-8	9-7	8	85.7	68	72	79	91	95

DIAGRAM 9-7G

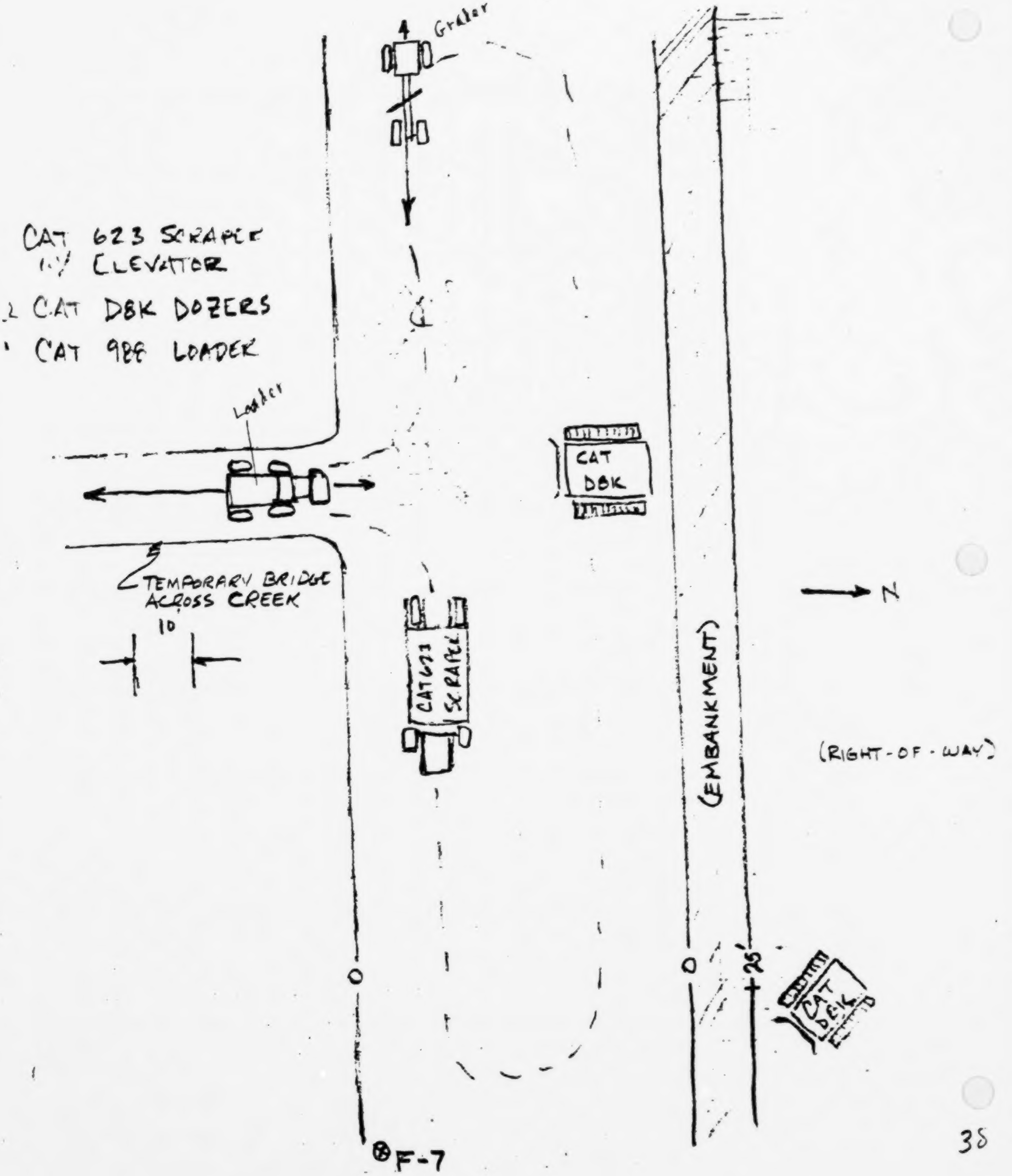
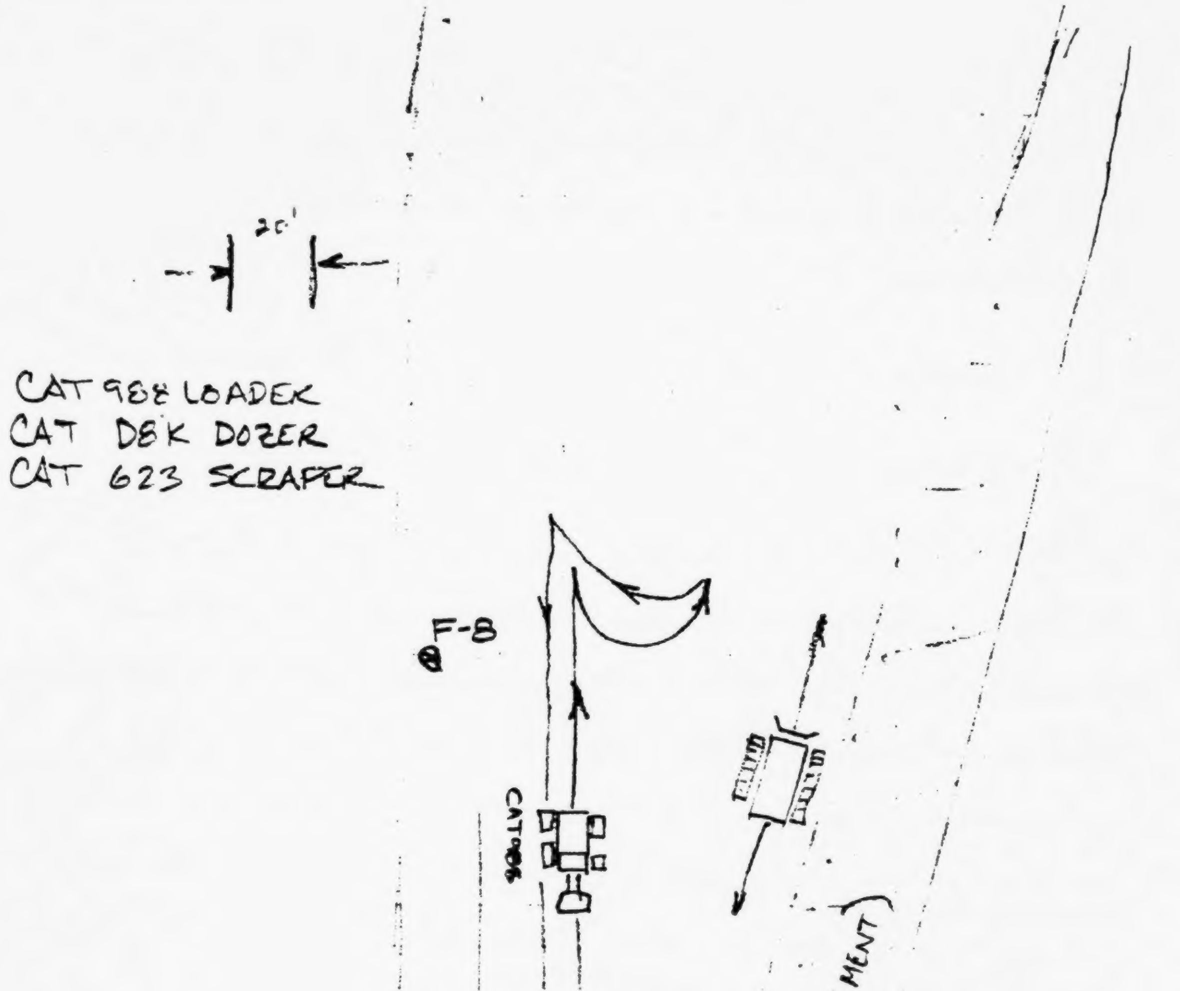

Grader
CAT 623 SCRAPER
W/ ELEVATOR
2 CAT D8K DOZERS
1 CAT 988 LOADER
Loader
TEMPORARY BRIDGE ACROSS CREEK
10'
CAT D8K
CAT 623 SCRAPER
(EMBANKMENT)
N
(RIGHT-OF-WAY)
0
0
25'
CAT D8K
F-7

DIAGRAM 9-7H


20'
CAT 988 LOADER
CAT D8K DOZER
CAT 623 SCRAPER
F-8
CAT 988
(FORWARD)
(REVERSE)
(EMBANKMENT)
TEMPORARY BRIDGE

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Subbase Finish Grading; S. of Sandy Blvd.

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Major grading is completed in this section; right-of-way, median and embankment are hard, compacted soil. Embankment approximately 30 feet high, w/ 2:1 slope

Machinery Description:

Hyster C620 vibratory roller
Cat 623 Scraper with elevator
Cat 140G Motor Grader

Miscellaneous Information:

Note: Engine fan on Roller was facing mic during south-to-north passby

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Subbase Finish Grading

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-19	S-1	9-7	1130	—	9-7F	VIBRATORY ROLLER PASSBY	—
-20	S-2	9-7	1145	7	9-7F	VARIOUS PASSBYS OF SCRAPER, GRADER, AND ROLLER	—

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Subbase Finish Grading

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-20	S-2	9-7	7	78.3	61	63	71	82	89

SINGLE EQUIPMENT/PROPAGATION NOISE MEASUREMENTS

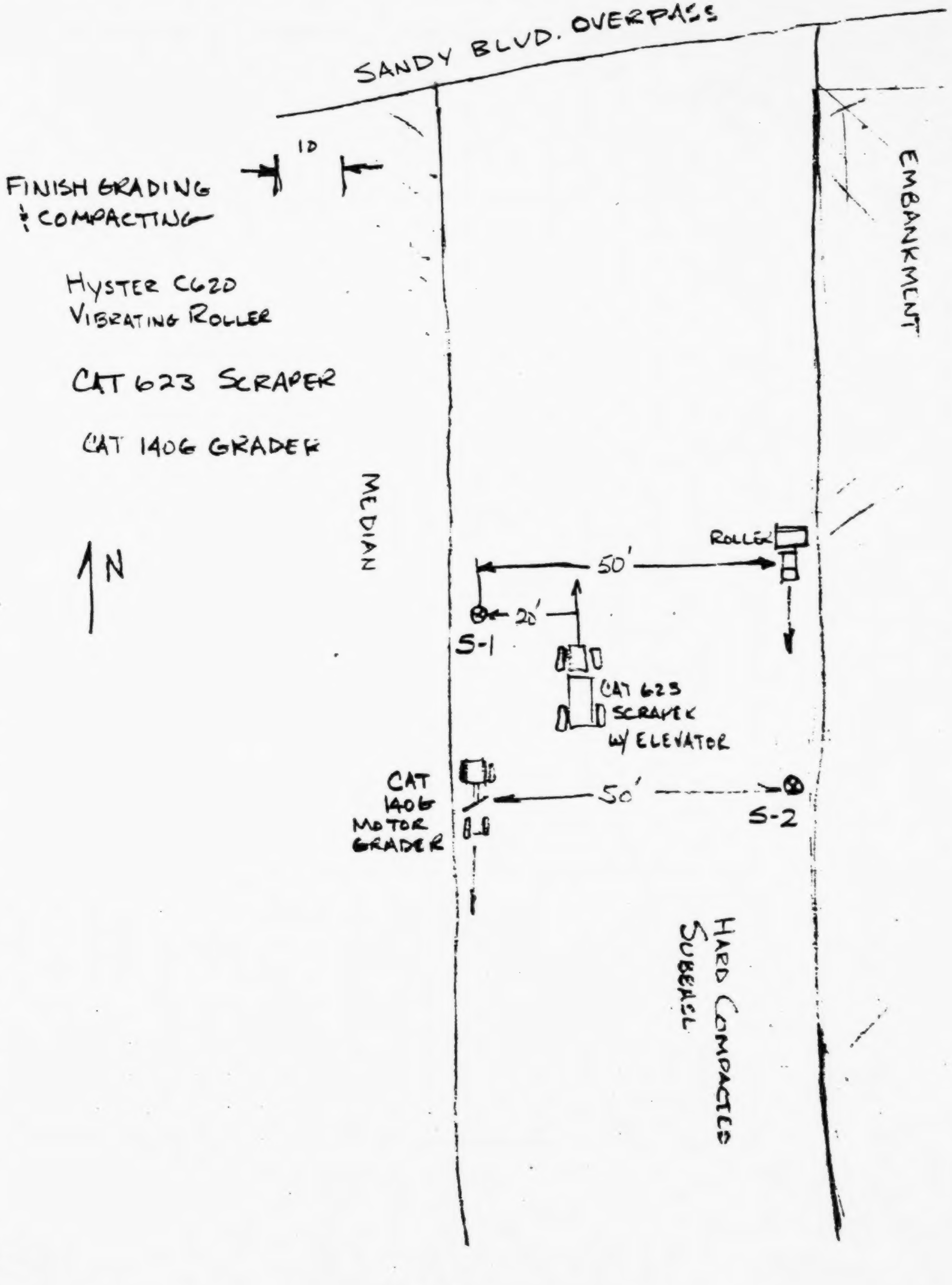
HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Subgrade Finish Grading

Sample	Location	Date	Equipment	L_{max} @ 50 ft.	L_{max} @ ___ ft.	L_{max} @ ___ ft.
45-19	S-1	9-7	HYSTER C620 ROLLER; PASSBY NORTH TO SOUTH	81		
45-19	S-1	9-7	HYSTER C620 ROLLER; PASSBY SOUTH TO NORTH	85		
45-20	S-2	9-7	CAT 1406 MOTOR GRADER PASSBY; LOW SPEED, NO LOAD	74		

DIAGRAM 9-7F


SANDY BLVD. OVERPASS
10
FINISH GRADING & COMPACTING
HYSTER C620 VIBRATING ROLLER
CAT 623 SCRAPER
CAT 140G GRADER
EMBANKMENT
MEDIAN
N
ROLLER
50'
20'
S-1
CAT 623 SCRAPER W/ ELEVATOR
CAT 140G MOTOR GRADER
50'
S-2
HARD COMPACTED SUBBASE

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Bridge Site I; S.E. corner of interchange

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Bare earth with some small schrubbery. Ground was wet due to rain.

Machinery Description:

Bucyrus-Erie 65C Crane w/ concrete bucket

Generator (type unknown)

Ready-Mix Concrete trucks

Miscellaneous Information:

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Bridge Site II; Powell St Overpass

Type of Measurements:

☐ Community
☑ Activity
☐ Propagation
☐ Site Boundary
☐ Single Equipment
☐ Movies

Soil/Terrain Conditions: Microphone at grade with bridge deck and concrete pump. Bridge deck consisted of concrete box girders.

Machinery Description:

Truck-mounted concrete pump, run by diesel engine.

Ready-mix concrete trucks; 2 backed up to concrete pump at all times.

Miscellaneous Information:

40

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Bridge Site III; S. shore of Columbia; construction of bridge piers

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Microphone located on embankment at same level as vibratory pile driving sheet pile into damp soil. Compressor located southeast of driver, about 20 feet below level of microphone.

Machinery Description:

Vibratory pile driver (type unknown)
Compressor
Crane

Miscellaneous Information:

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Bridge Site IV, @ Banfield interchange

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Microphone at grade with bridge deck consisting of wood and re bar; mic. 8' above ground level of concrete pump. One ready-mix truck backed up to pump at all times.

Machinery Description:

Truck-mounted concrete pump run by diesel engine

Ready-mix concrete trucks

Miscellaneous Information:

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept. 1979

SITE LOCATION: Bridge Sites I, II, III

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-1	B-1	9-5	0915	17	9-5A	CONCRETE POUR USING CRANE & BUCKET.	✓
-2	B-2	9-5	1300	9	9-5C	CONCRETE POUR USING CONCRETE PUMP;	✓
-12A	B-3	9-6	1400	5	9-6E	VIBRATORY HAMMER WITH SUPPORTING EQUIP.	✓
-12B	B-3	9-6	1410	18	9-6E	VIBRATORY HAMMER WITH SUPPORTING EQUIP.; DROP HAMMER WORKING 300 FT. AWAY.	✓
-15	B-4	9-7	0900	15	9-7B	CONCRETE POUR WITH PUMP	✓

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I- 205

DATE: Sept 1979

SITE LOCATION: Bridge Sites I, II, III

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_{1}
45 - 1	B-1	9-5	17	74.5	64	72	74	76	79
-2	B-2	9-5	9	65.9	56	64	66	67	69
-12A	B-3	9-6	5	80.5	76	77	78	84	85
-12B	B-3	9-6	18	99.6	89	90	98	104	107
-15	B-4	9-7	15	85.1	76	77	86	87	90

DIAGRAM 9-5A

WYLE LABORATORIES - Wyle Research, El Segundo, California Page ____

epared by: ____________ Date: ____________ Subject: ____________

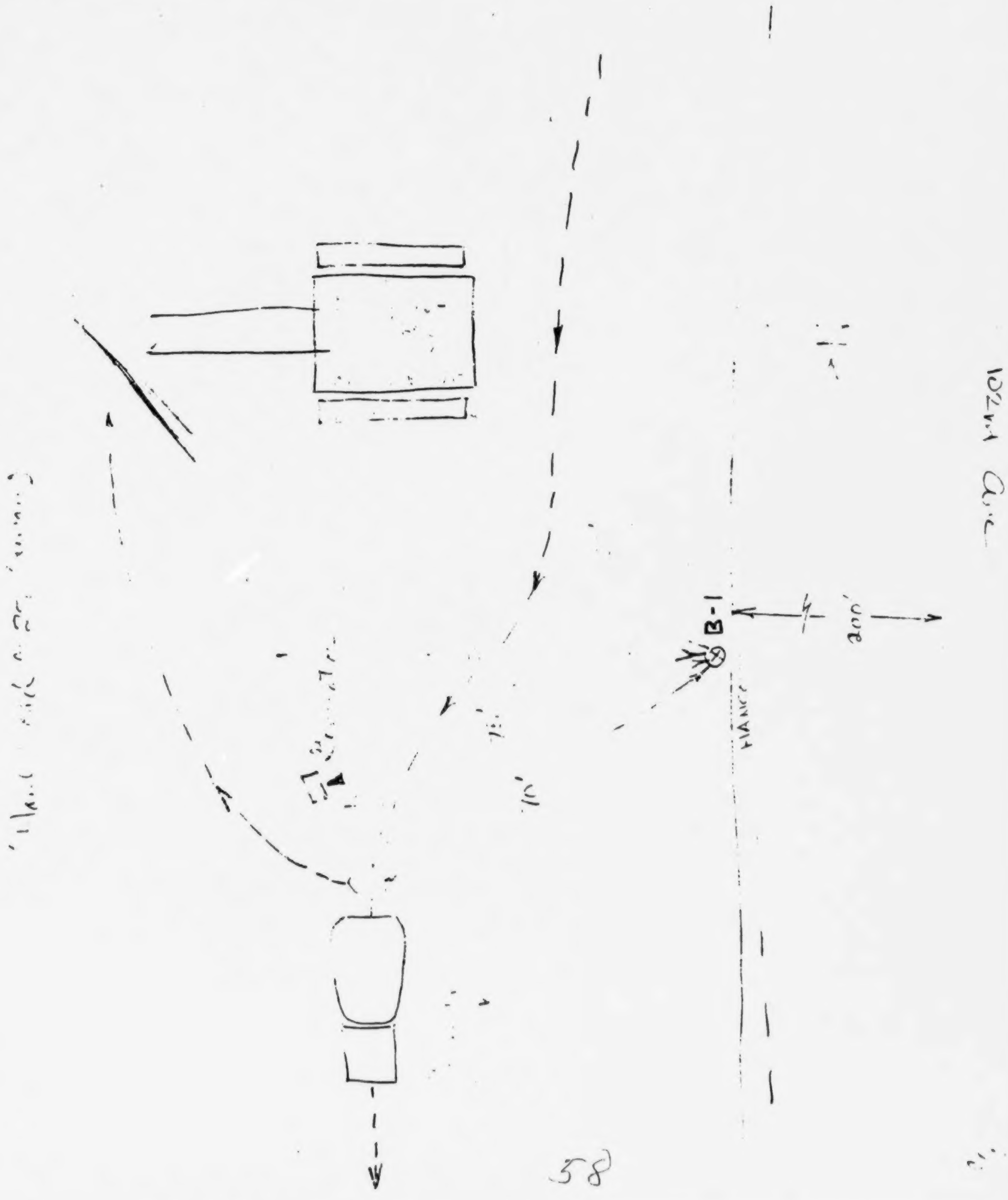

102nd Ave
B-1
300'
HANG
10'

DIAGRAM 9-5C

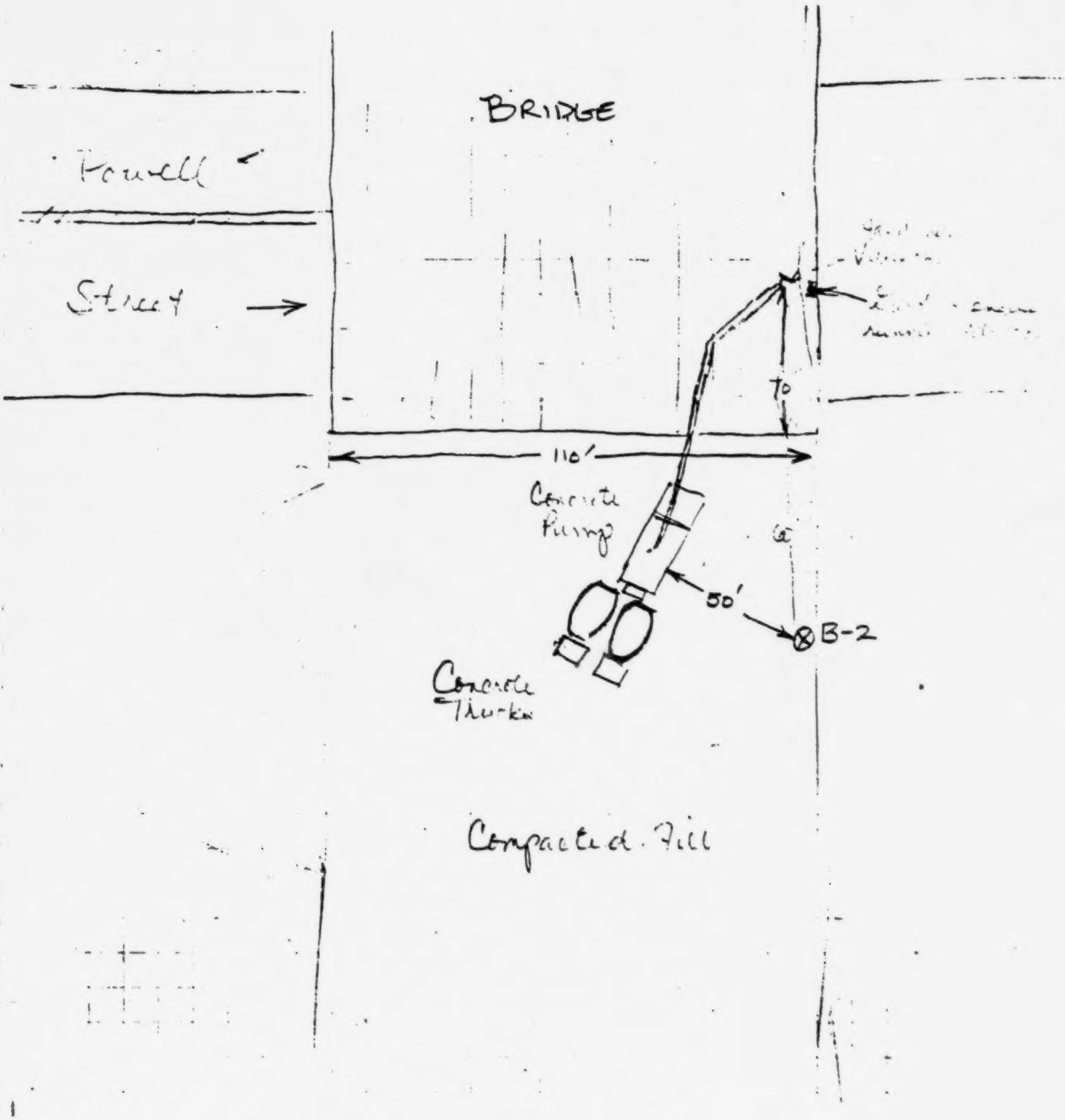

BRIDGE
Powell
Street
70
110'
Concrete Pump
6'
50'
B-2
Concrete Trucks
Compacted Fill

DIAGRAM 9-6E

FIRST 10 MINUTES
ANALOG #12 N/G

(SEE REVERSE SIDE

10'

VIBRO-HAMMER

PILE DRIVER
OPERATING INTER-
MITTENTLY 500'
FROM MIC.
POSITION

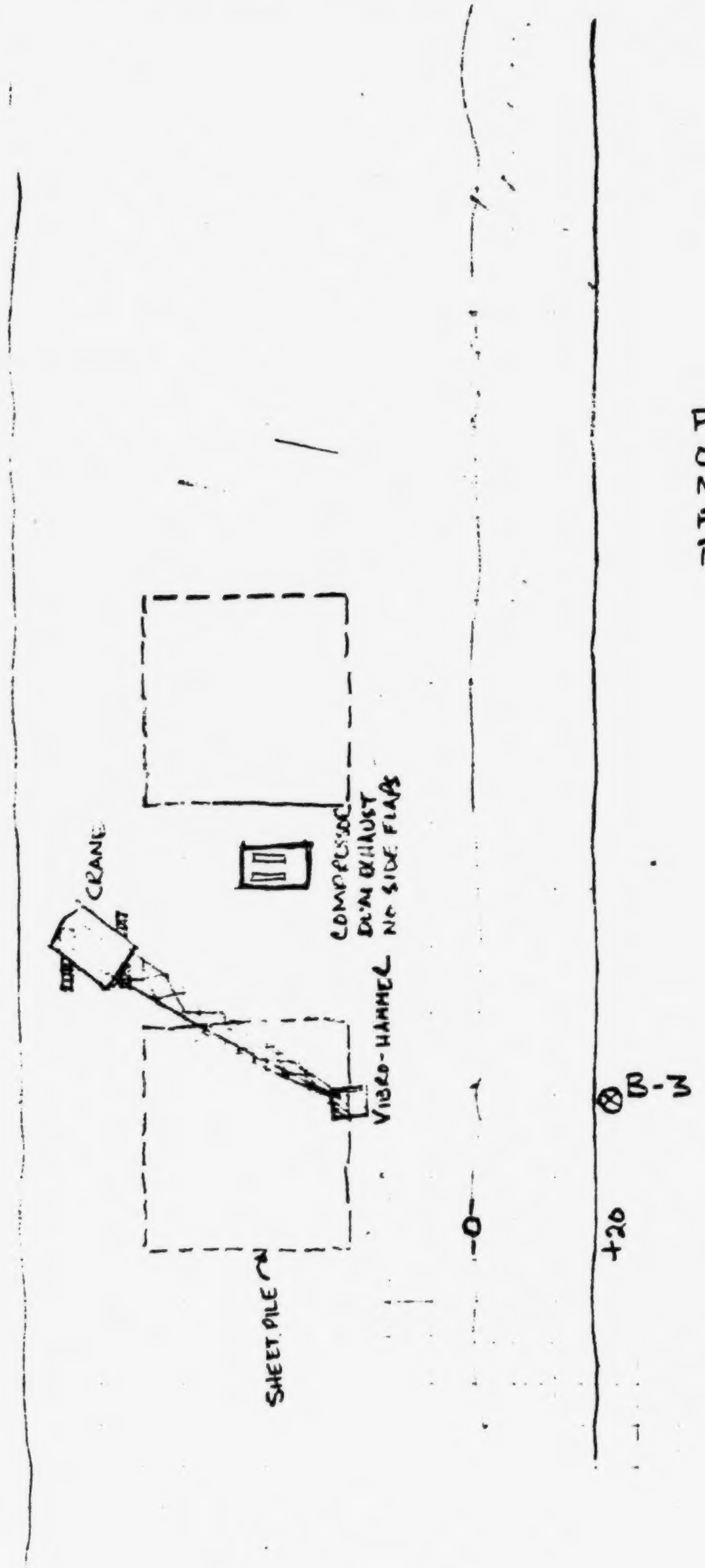
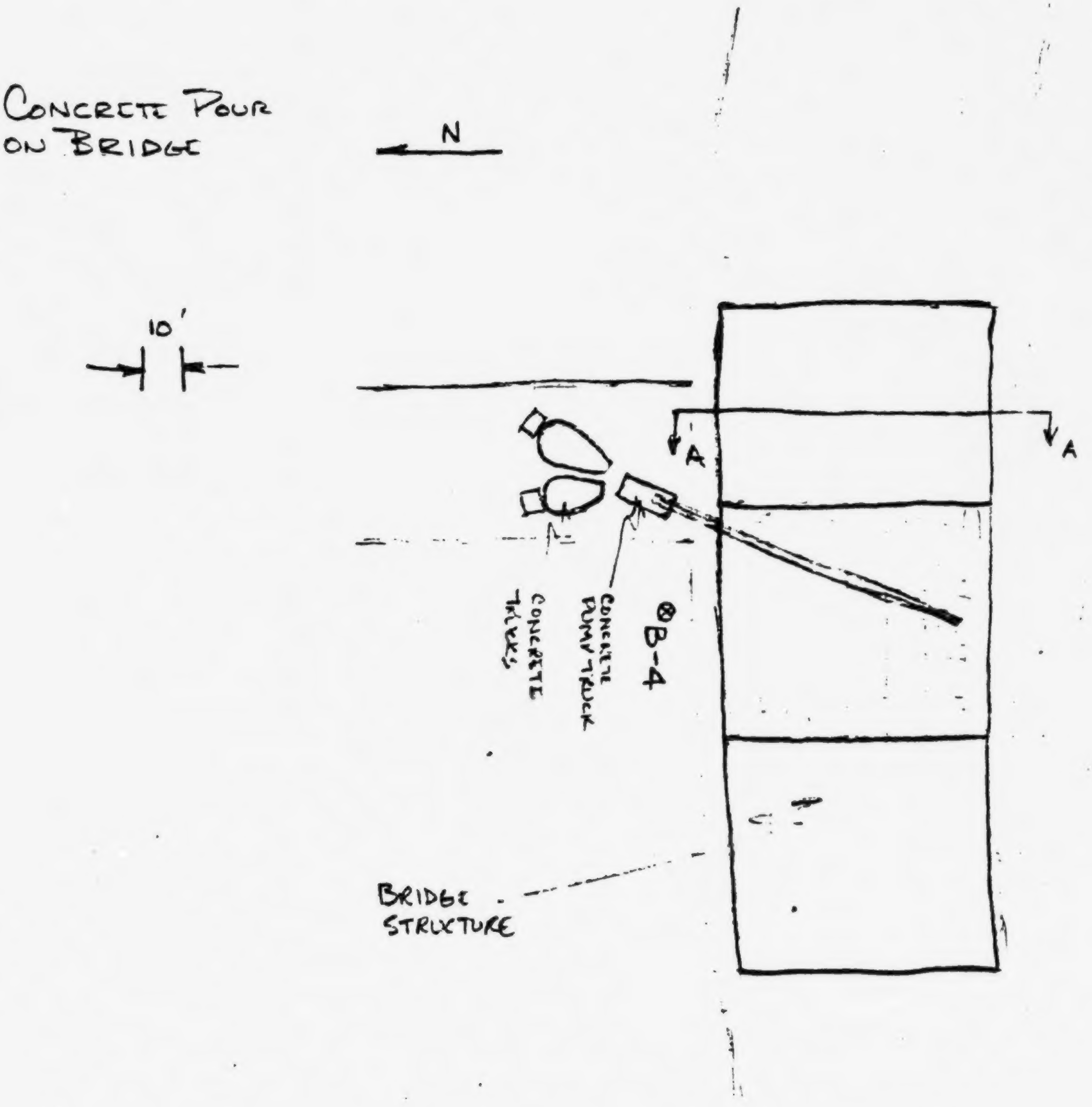

CRANE
COMPRESSOR
DUAL EXHAUST
NO SIDE FLAPS
VIBRO-HAMMER
SHEET PILE
B-3
0
+20

DIAGRAM 9-7B


CONCRETE POUR
ON BRIDGE
N
10'
A
A
CONCRETE TRUCKS
CONCRETE PUMP TRUCK
⊗B-4
BRIDGE STRUCTURE

Measurement Site Data

Highway: I-205

Date: Sept 1979

Site Location: Haul Road Passbys of End Dumps and Scrapers.

Type of Measurements:

☐ Community ☑ Activity ☐ Propagation

☐ Site Boundary ☑ Single Equipment ☐ Movies

Soil/Terrain Conditions: Diagram 9-6D: Level ground. Hard, compacted soil vehicle path & H-1; loosely compacted, uneven soil between vehicle path & H-2. Ground was very wet. Diagram 9-7D: Hard, compacted soil between vehicle path and H-3. Embankment with 2:1 slope behind microphone.

Machinery Description:

Cat. 769 End Dumps w/ exhaust built into bed of trailer. Exhaust port faces microphone during unloaded passby.

Fiat-Allis 460 & 460C Scrapers

Miscellaneous Information: Scrapers approaching mic from the west (unloaded) were coming up a small grade.

DATA LOG SUMMARY

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Haul Road Passbys

Sample	Location	Date	Time	Dur.	Site Diag.	Comments	Reduced
45-10	H-1	9-6	1100	:10	9-6D	END DUMP PASSBYS AT 50 FT.; # OF PASSBYS = 2 (+2 PICKUPS)	✓
-11	H-1 & H-2	9-6	1115	:10	9-6D	END DUMP PASSBYS AT 50 & 100 FT. # OF PASSBYS = 8 (+1 DOZER & 1 FLATBED)	✓
-17	H-3	9-7	0945	:17	9-7D	SCRAPER PASSBYS AT ~30-50 FT.	✓

ACTIVITY NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Haul Road Sites

Sample	Location	Date	Dur.	L_{eq}	L_{99}	L_{90}	L_{50}	L_{10}	L_1
45-10	H-1 (50')	9-6	:10	85.3	57	68	75	90	96
-11	H-1 (50')	9-6	:10	80.1	63	65	72	84	90
-11	H-2 (100')	9-6	:10	81.5	—	—	—	—	—
-17	H-3	9-7	:17	70.6	50	54	60	74	83

SINGLE EQUIPMENT/PROPAGATION NOISE MEASUREMENTS

HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: HAUL ROAD PASSBYS

Sample	Location	Date	Equipment	L_{max} @ 50 ft.	L_{max} @ 100 ft.	L_{max} @ ___ ft.
45-11	H-1/H-2	9-6	CAT 769; LOADED	95	87	–
-11	H-1/H-2	9-6	CAT 769; UNLOADED	93	85	–
45-17	H-3	9-7	FIAT-ALLIS 460 SCRAPER LOADED	78	–	–
-17	H-3	9-7	FIAT-ALLIS 460 SCRAPER UNLOADED	84	–	–

DIAGRAM 9-6D

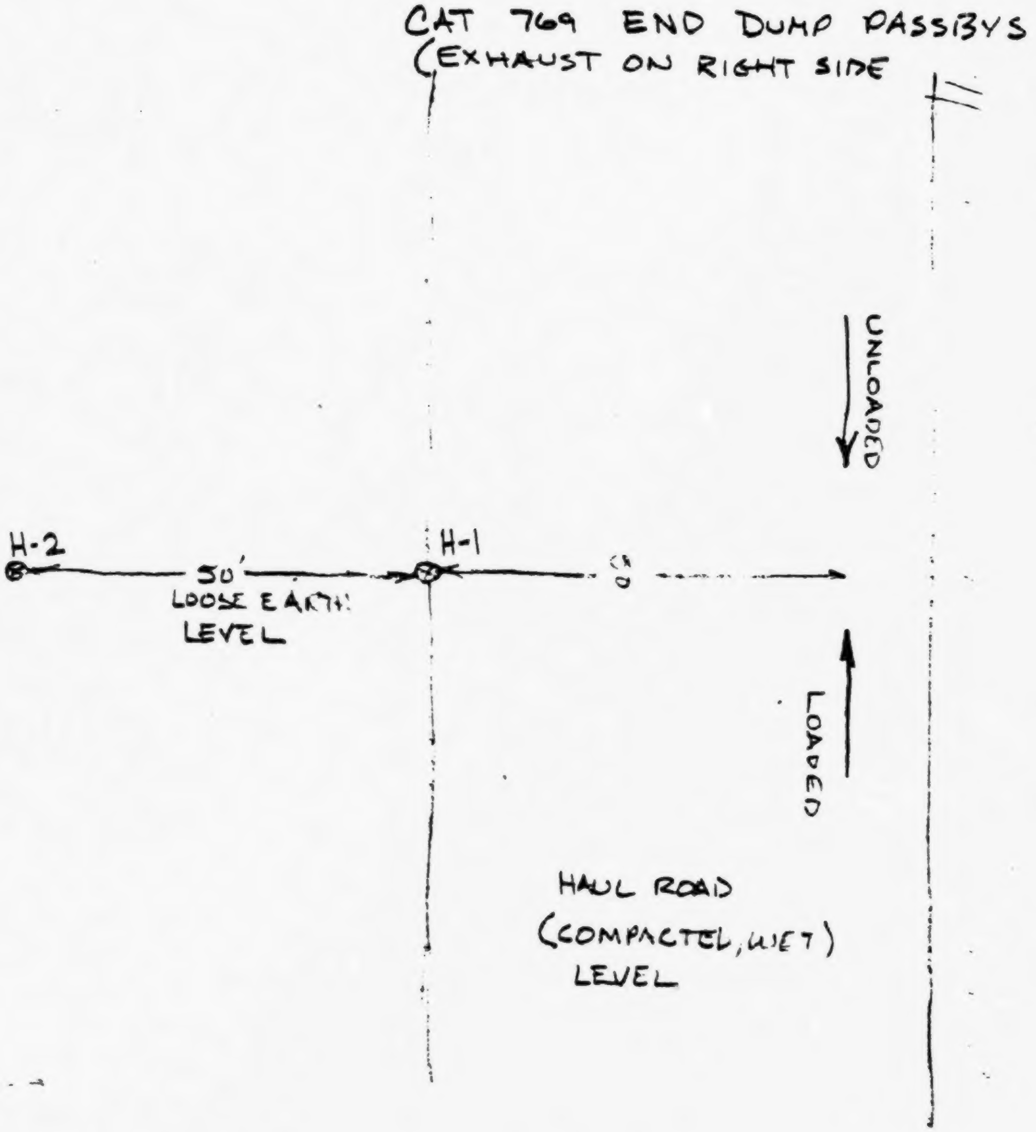
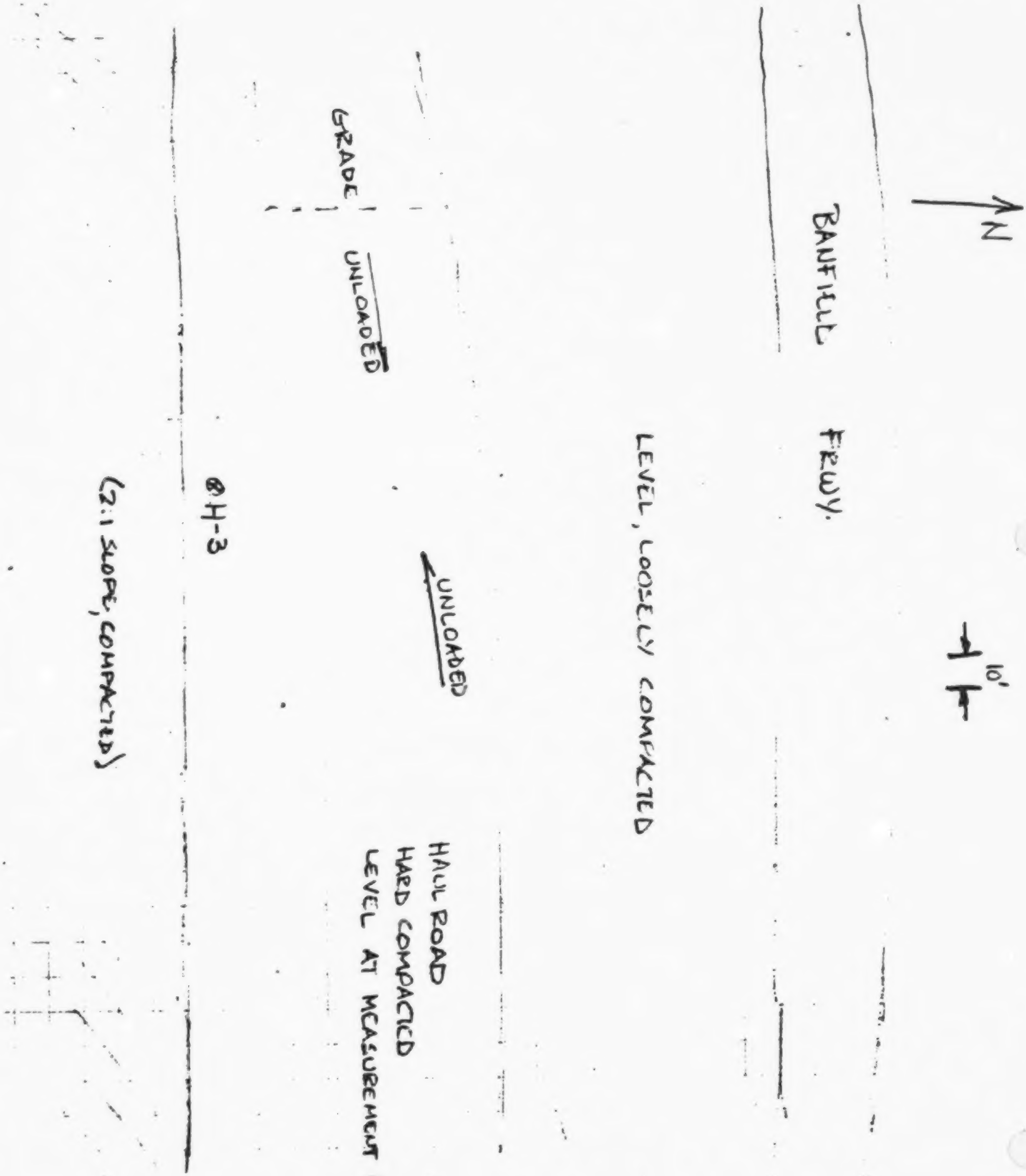

CAT 769 END DUMP PASSBYS
(EXHAUST ON RIGHT SIDE
UNLOADED
H-2
50'
LOOSE EARTH
LEVEL
H-1
LOADED
HAUL ROAD
(COMPACTED, WET)
LEVEL

DIAGRAM 9-7D


N
BANFIELD FRWY.
10'
LEVEL, LOOSELY COMPACTED
GRADE
UNLOADED
UNLOADED
BH-3
(2:1 SLOPE, COMPACTED)
HAUL ROAD
HARD COMPACTED
LEVEL AT MEASUREMENT PT.

Measurement Site Data

Highway: I-205 **Date:** Sept 1979

Site Location: Cut Area I; Propagation Measurements for Dozer

Type of Measurements:

☐ Community ☐ Activity ☑ Propagation

☐ Site Boundary ☐ Single Equipment ☐ Movies

Soil/Terrain Conditions: Level area. Loosely compacted soil and small rock. Ground very wet from rains the previous day.

Machinery Description:

Cat. D8H Track Dozer

Miscellaneous Information: Measurements made at 50' & 100'; then measurements repeated with mic.'s at 50' and 200'. Dozer noise levels measured for IMI's.

6'

SINGLE EQUIPMENT/PROPAGATION NOISE MEASUREMENTS

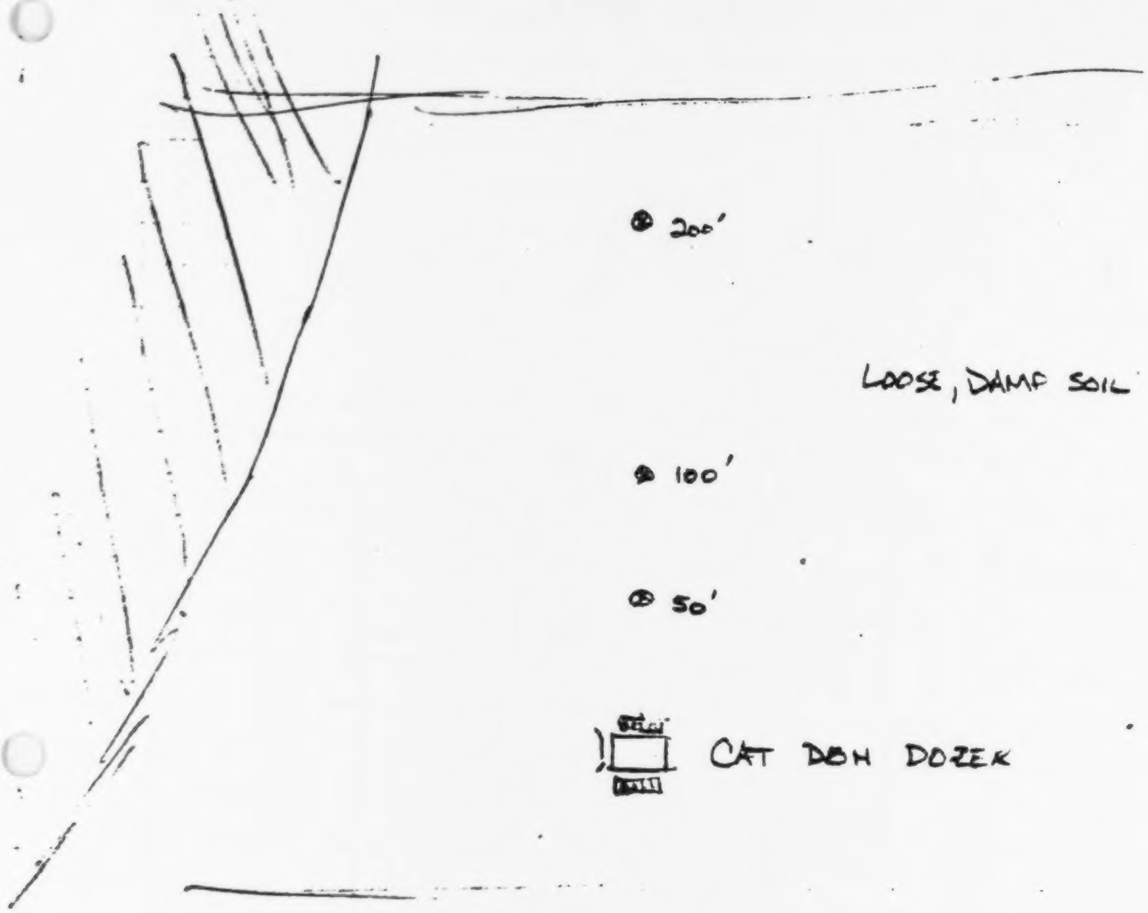
HIGHWAY: I-205

DATE: Sept 1979

SITE LOCATION: Cut Aria I

Sample	Location	Date	Equipment	L_{max} @ 50 ft.	L_{max} @ 100 ft.	L_{max} @ 200 ft.
45-18	E-1	9-7	CAT D8H DOZER; IMI	84 0.5	79	73

DIAGRAM 9-7E

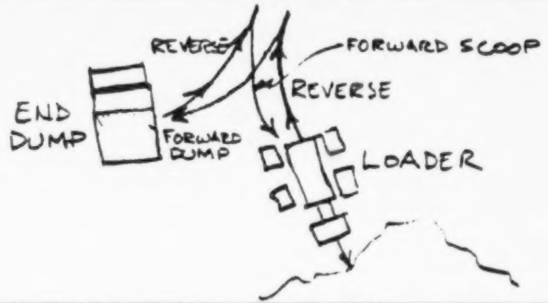

200'
LOOSE, DAMP SOIL
100'
50'
CAT D8H DOZER

EQUIPMENT ACTIVITY ANALYSIS

HIGHWAY: I - 205 DATE: Sept. 1979

EQUIPMENT CYCLE: CAT 988 LOADER; LOADING CAT 769 END DUMPS

Motion Diagram:


REVERSE
FORWARD SCOOP
REVERSE
END DUMP
FORWARD DUMP
LOADER

Motion Characteristics	Measured Time								
	Motion	Cycle	Motion	Cycle	Motion	Cycle	Motion	Cycle	Average
FORWARD SCOOP	12		(13)		6				
REVERSE	7		7		15				
FORWARD DUMP	13	39	9	38	9	42			
REVERSE	7		9		12				
FORWARD SCOOP	13		16		7				
REVERSE	10		9		14				
FORWARD DUMP	17	47	14	47	10	42			
REVERSE	7		8		11				
FORWARD SCOOP	12		12		5				
REVERSE	8		-		10				
FORWARD DUMP	17	44			11	37			
REVERSE	(7)				11				
FORWARD SCOOP					7				
REVERSE					11				
FORWARD DUMP					10	45			
REVERSE					17				

15

6

Photo Log - 35 mm

	Frame #	Location	Date	Time	View or Subject
Roll #1	25	Cut Area I	9/5	9:00a	@ C-2; Looking west from top of site boundary berm
	26	" " "	↓		Same as #25, looking S.W.
	27	Bridge Site I	↓		Concrete truck loading bucket
	28	" " "	↓		Crane used for concrete pour
	29	" " "	↓		Same as # 28
	30	Bridge Site II	↓	12:00	@ B-2, looking S.E. at concrete pump.
	31	" " "	↓		@ B-2, looking east at concrete truck and pump.
	32	Cut Area I	↓		general vicinity of C-4, looking at backhoe
	33	" " "	↓		@ C-1, looking west
	34	" " "	↓		@ C-1, looking S.W.
	35	" " "	↓		@ C-1, looking N.W.
Roll #2	1	Cut Area I	9/5	1615	@ C-4; trenching operation
	2		↓		same as #1
	3	Fill (Cut) Area I	9/6	0900	@ F-1 looking down on dozer/loader operation, looking east
	4	" " " "	↓		same as # 3
	5	Fill Area II	↓	0945	F-4; scraper unloading near mic.
	6	" " "	↓		F-4; looking directly west @ scraper
	7	Fill Area II	↓		@ F-4; looking due east, with F-5 in background, haul road behind
	8	Fill Area III	↓		F-6; looking south at end dump unloading
	9	" " "	↓		same as #8
	10	" " "	↓		looking southeast at end dump unloading

Photo Log - 35 mm

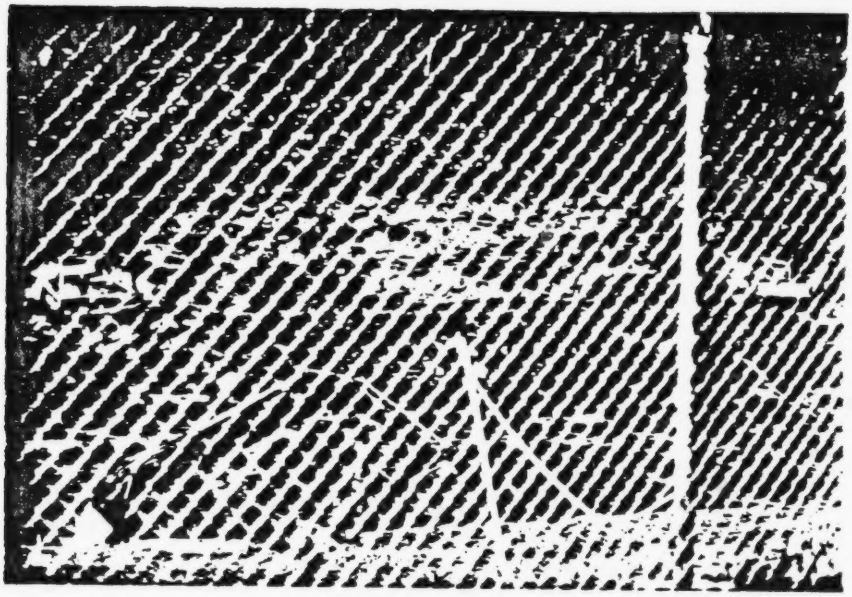
Frame #	Location	Date	Time	View or Subject
11	Fill (Cut) Area I	9/6	1040	@F-3, looking west at loading operation
12	" " " "			Same as #11; Cat. 769 End Dump
13	" " " "			Cat. 769 End Dump
14	Bridge Site III		1400	B-3; looking north at vibratory driver
15	" " "			B-3; vibratory driver
16	" " "			B-3; Crane supporting the driver. Compressor at right is pile driver power source
17	Cut Area II	9/7	0800	C-8; looking down at loading operation
18	" " "			same as #17; movie camera in foreground
19	" " "			C-10; community site near cut area
20	Cut Area I			C-5; looking north at trenching operation
21	" " "			Same as #21
22	Bridge Site 4			B-4: looking south at bridge deck; bottom of concrete pump visible
23	" " "			B-4; looking east at concrete trucks feeding concrete pump.
24	Haul Road Site II			H-3, looking north as scraper passes mic. position.
25	" " " "			Same as #24
26	" " " "			Same as #24
27	Single Equip. Site; E-1			Looking S.W. past 50' and 100' mic position
28	" " " "			General view of terrain over which propagation measurements were made
29	" " " "			CAT D8H Dozer used for single equip propagation measurements
30	Subbase Finish Grading			S-1; looking east at Hyster Roller.
31	" " "			Hyster C620 Roller

Photo Log - 35 mm

Roll #3

Frame #	Location	Date	Time	View or Subject
32	Subbase Finish Grading	9/7		S-2; looking N.W. at CAT 140G grader
33	Fill Area IV	↓		F-7; looking west
34	" " "			Same as #33
35	" " "			F-8; looking S.W. at loader & dozer
36	" " "			From embankment N of F-7, looking S.W. at loader and scraper.
1	Abatement Demo.			D-1, looking east as scraper passes a [illegible] position.
2	" "			D-1, looking S. at highway side of earth berm.
3	" "			Top of berm looking west towards D-2
4	" "			D-1, looking N. at highway side of earth berm.
5	" "			looking east towards D-1 from top of berm
6	" "			looking south at highway side of earth berm
7	" "			D-2, looking east at residential side of berm
8	" "			Same as #7
9	" "			Top of berm looking west towards D-2
10	" "			Same as #9
11	Cut Area I	9/8	0850	C-6; community measurement site
12	" " "	9/8		C-6; looking west towards construction site

ROLL #1



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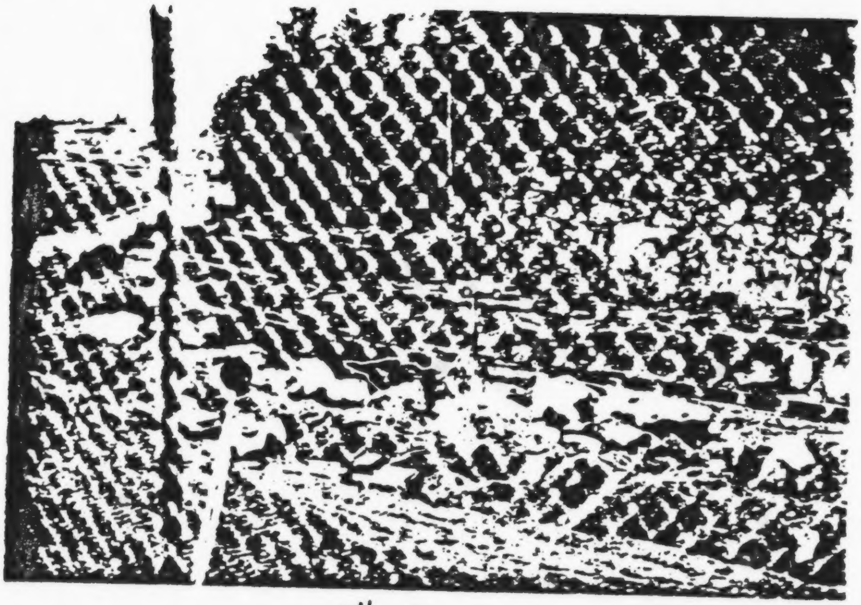

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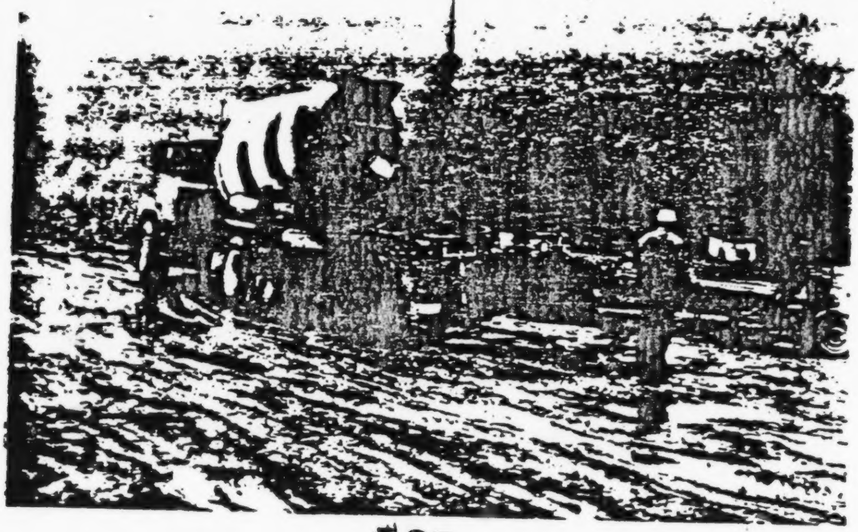
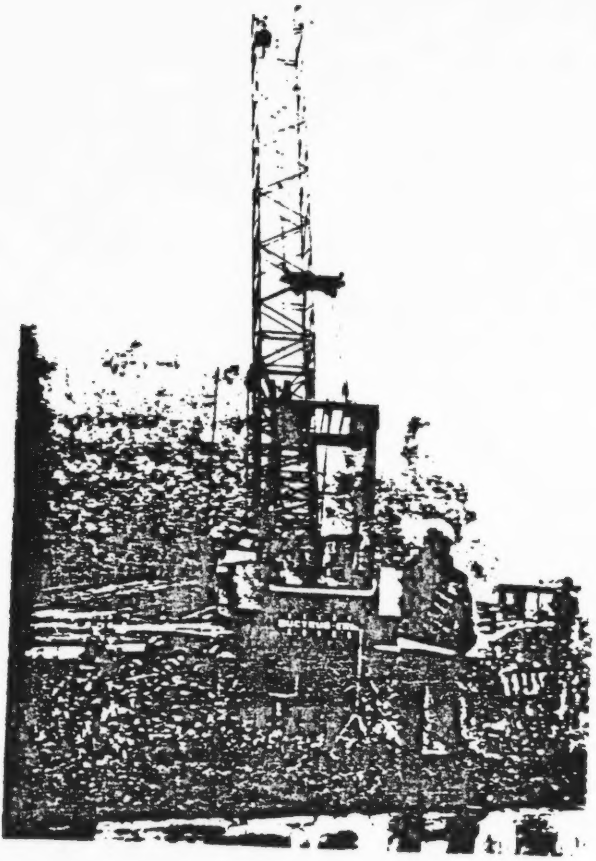


#27



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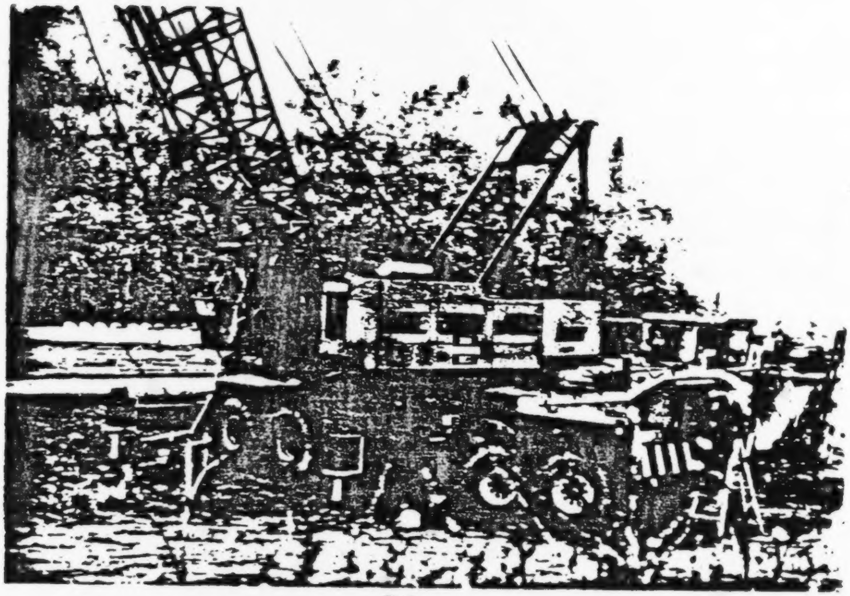

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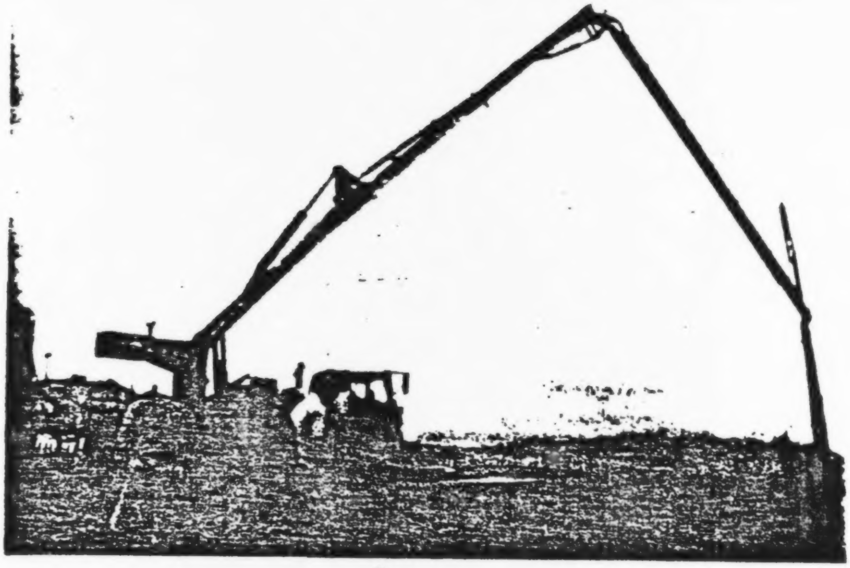

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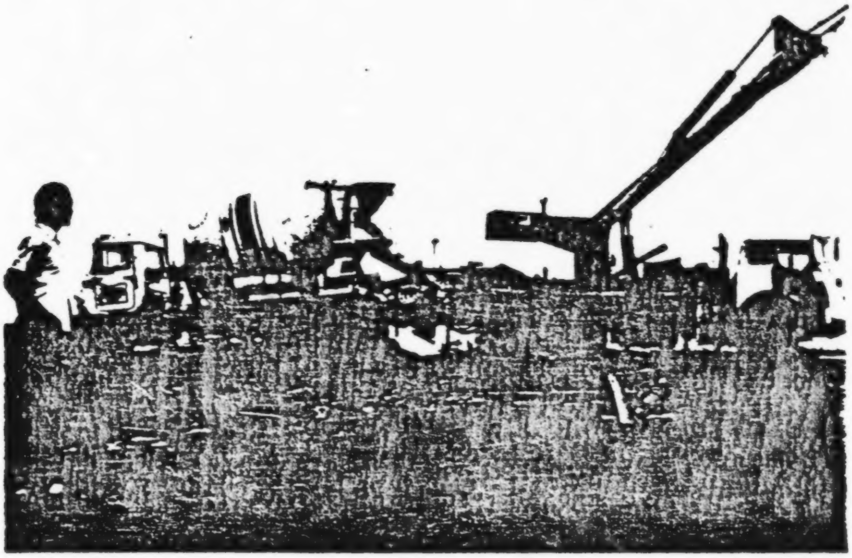

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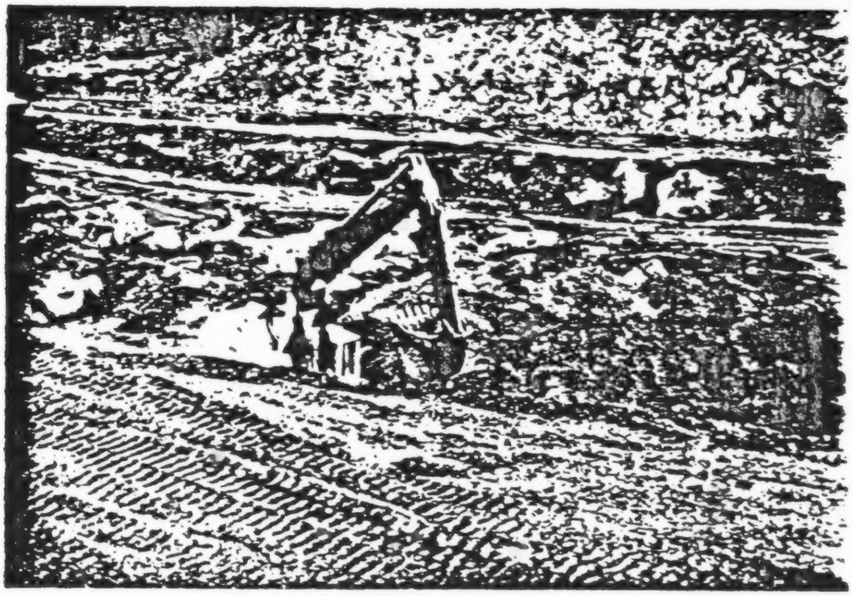

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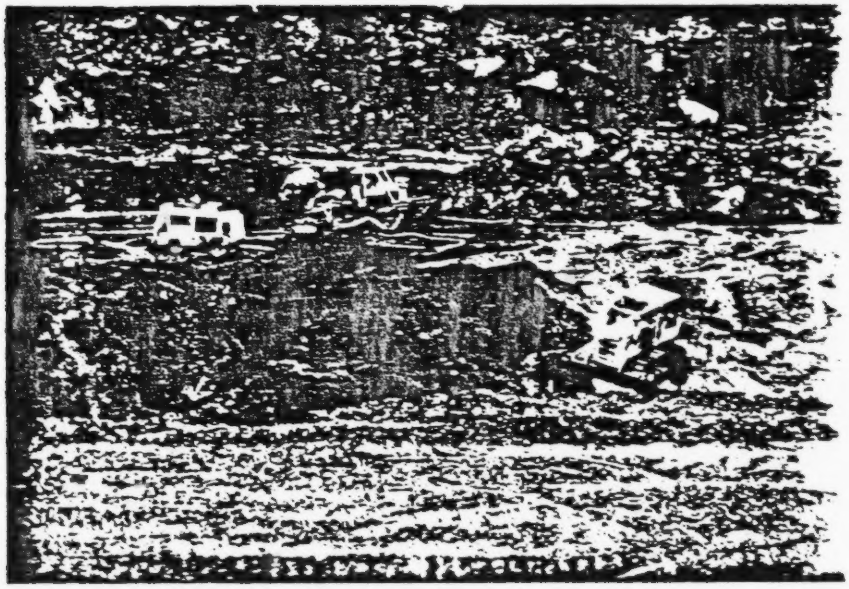

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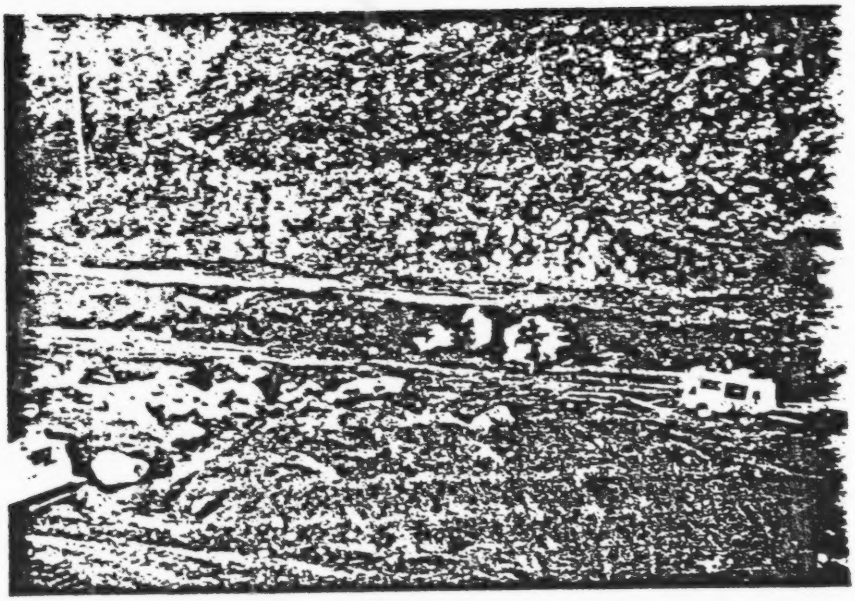

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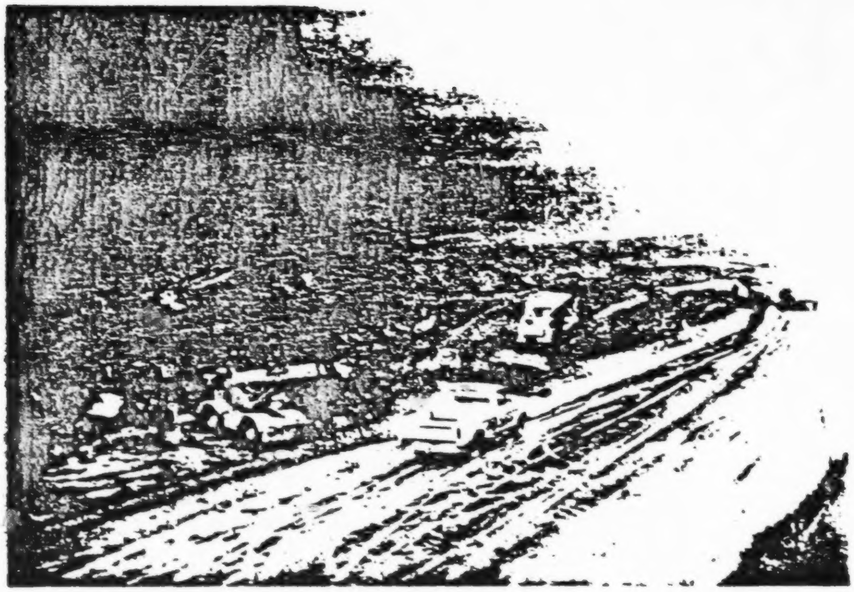

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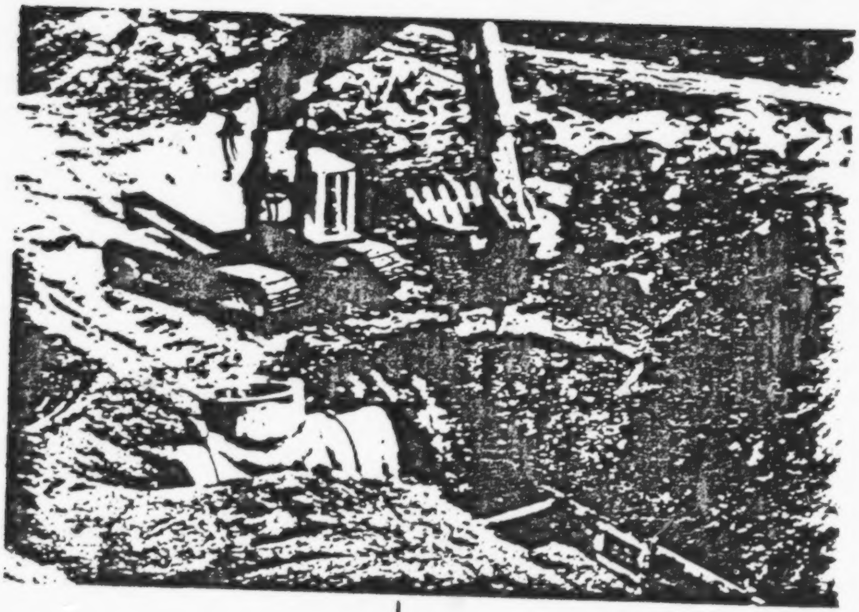

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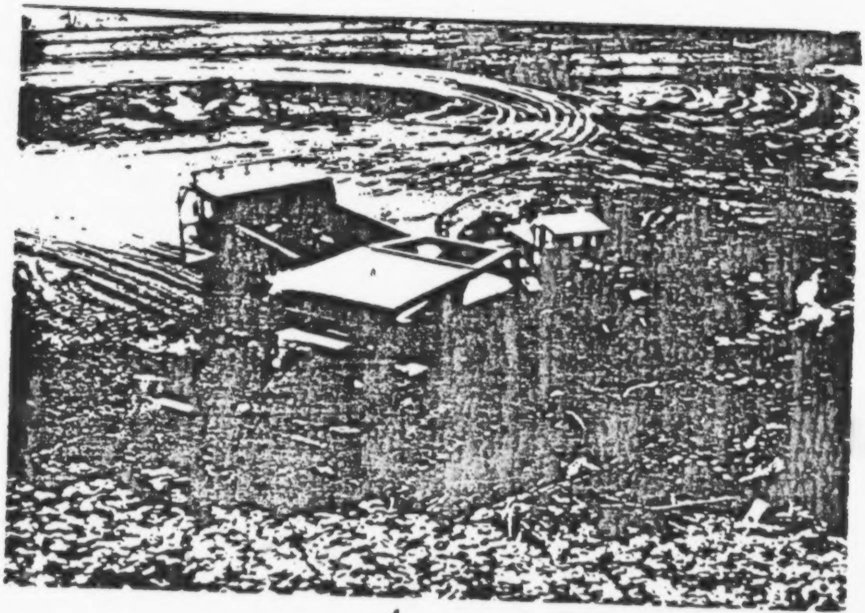

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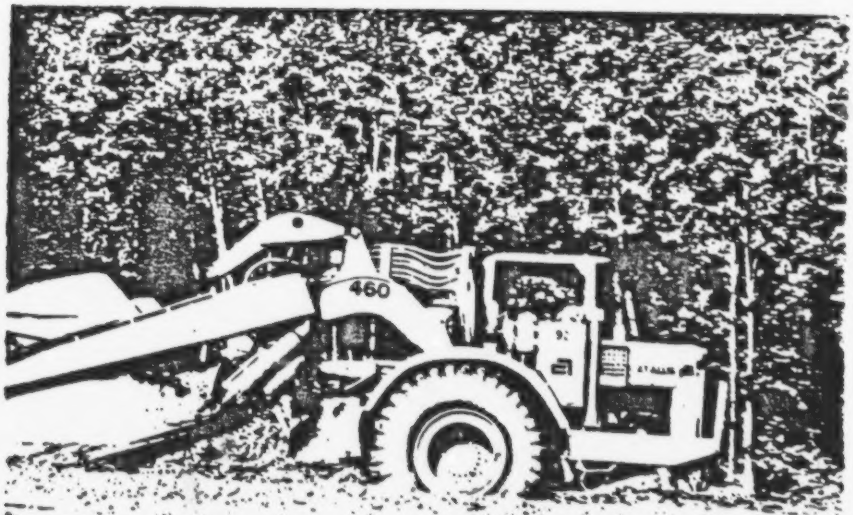

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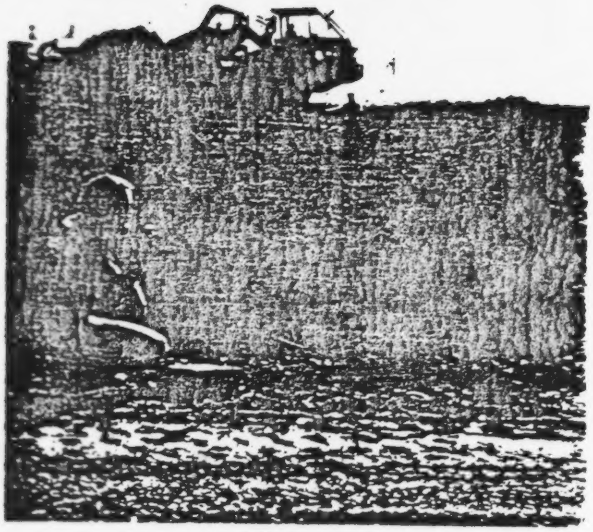

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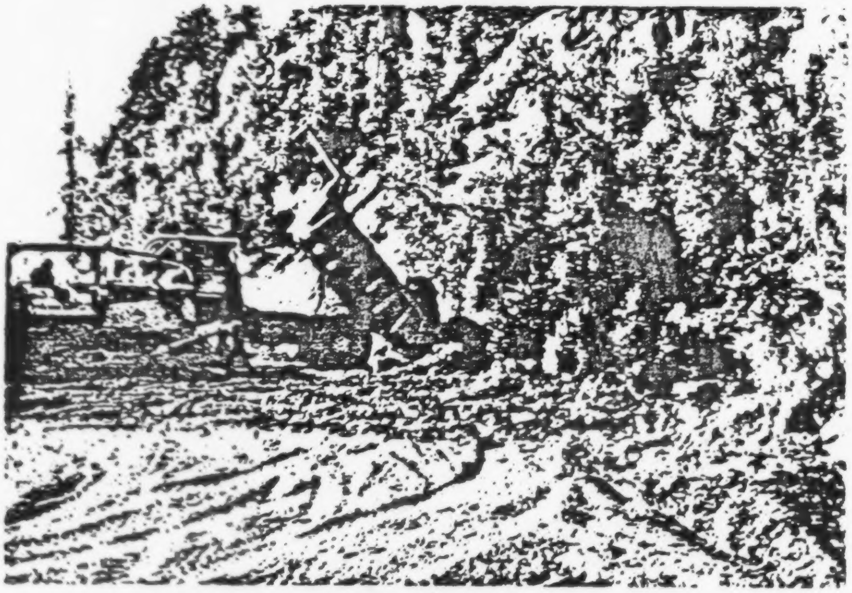

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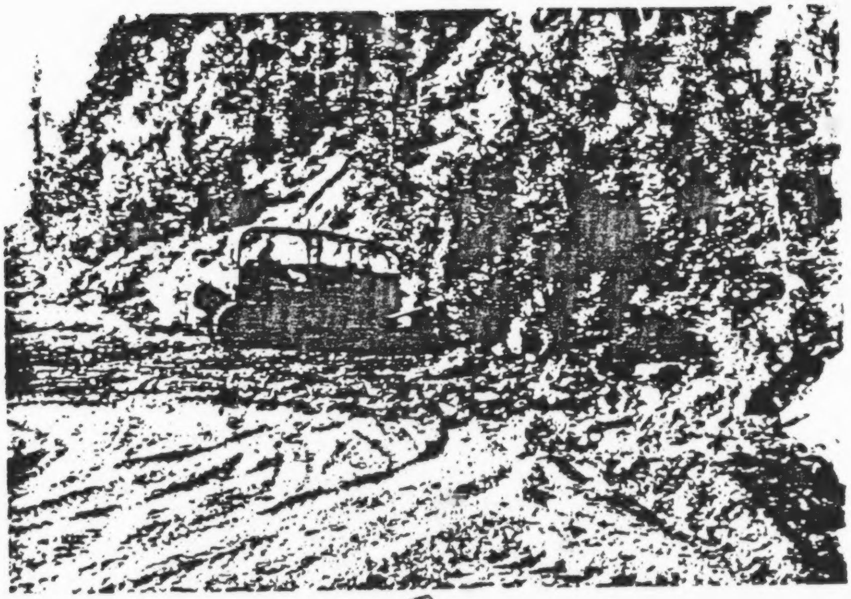

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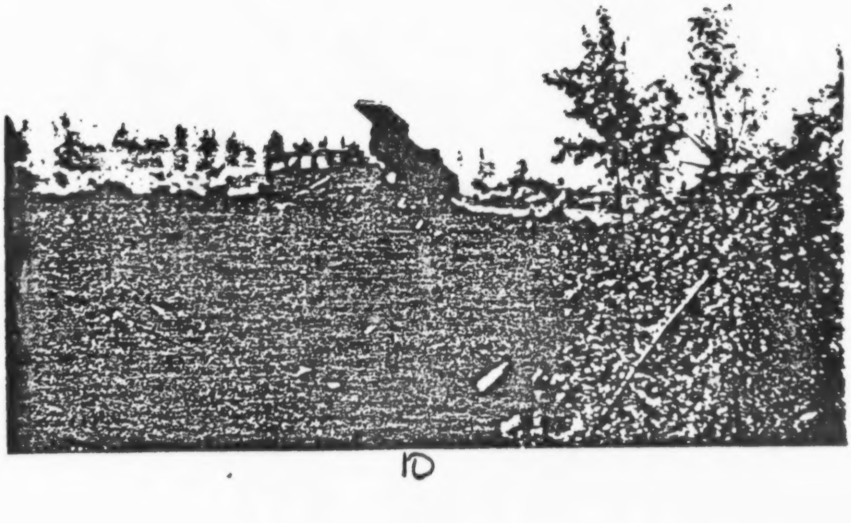

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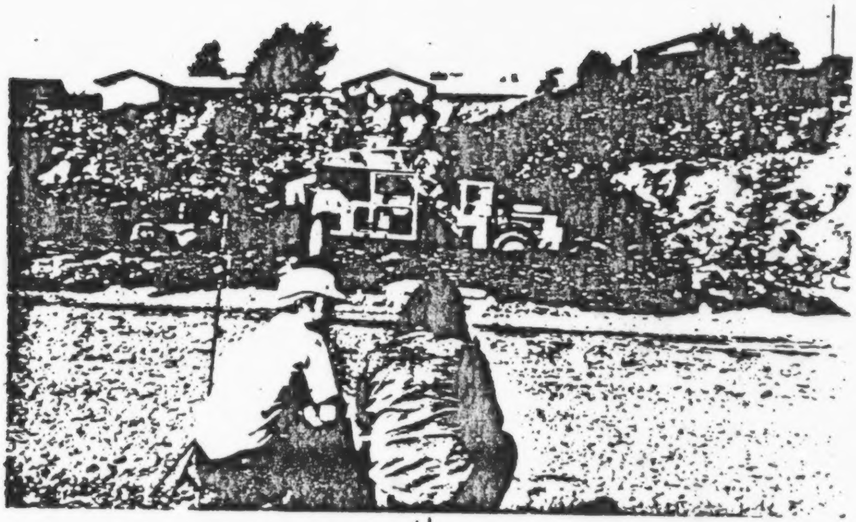

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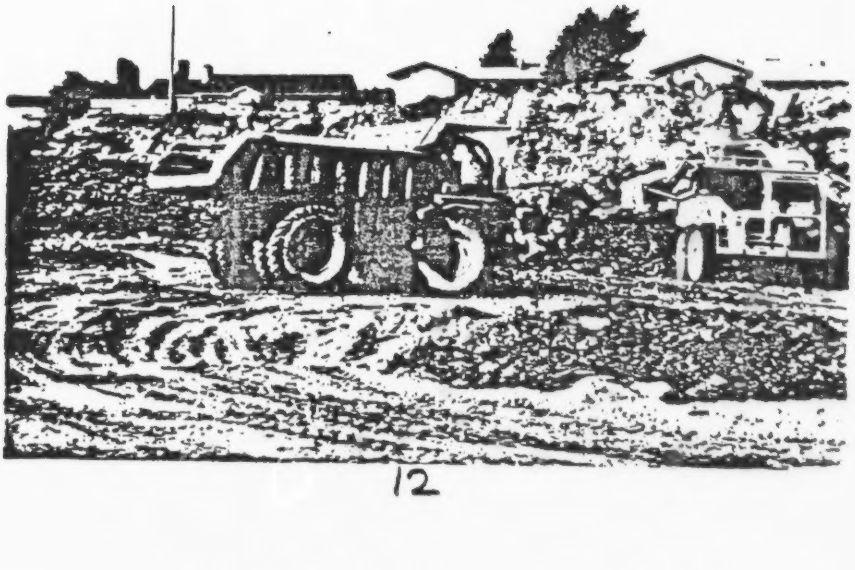

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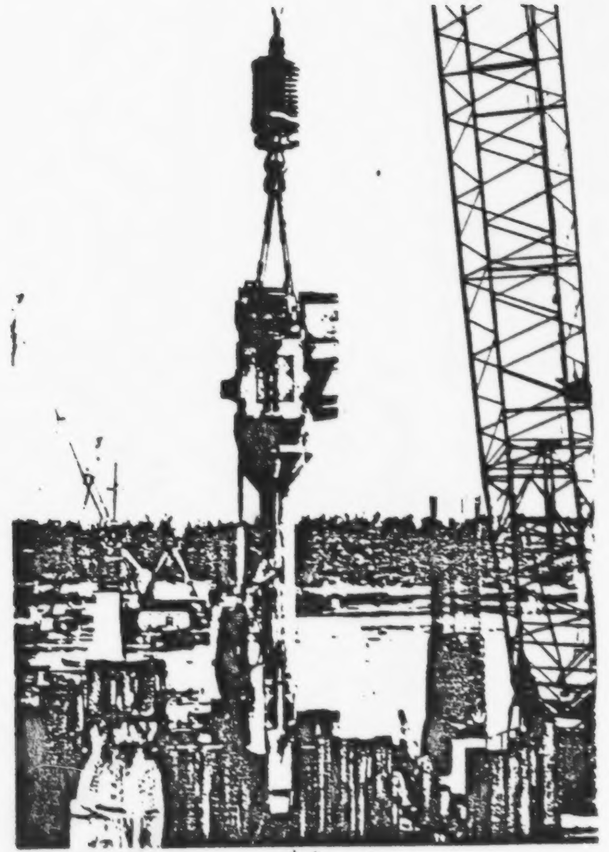
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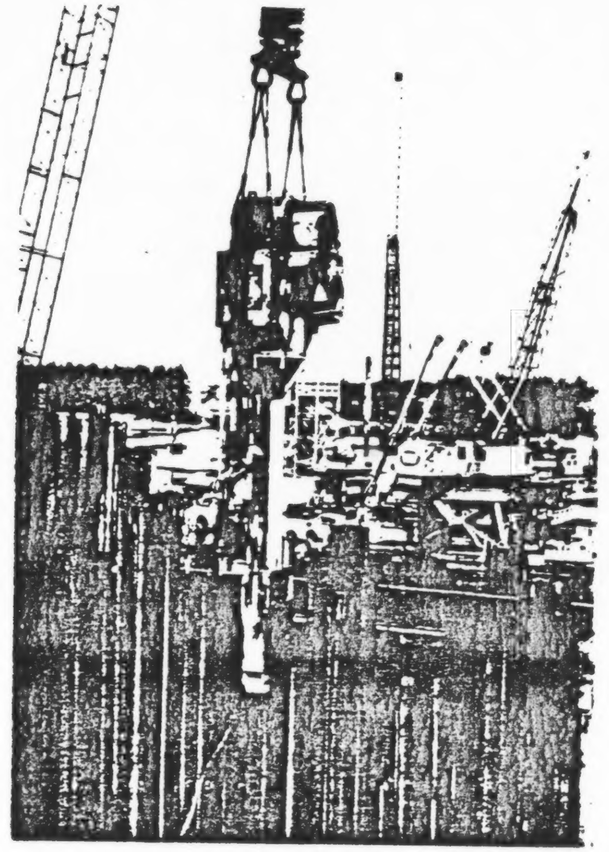
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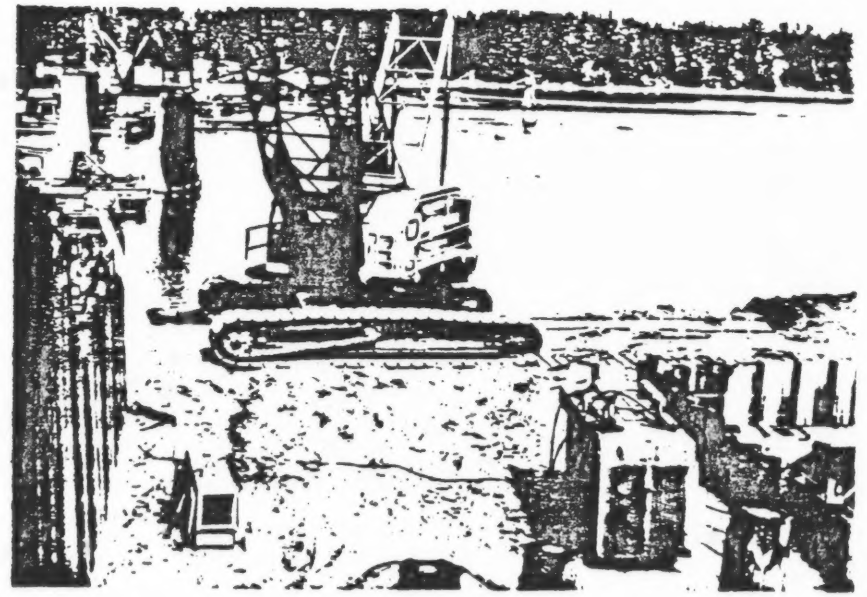
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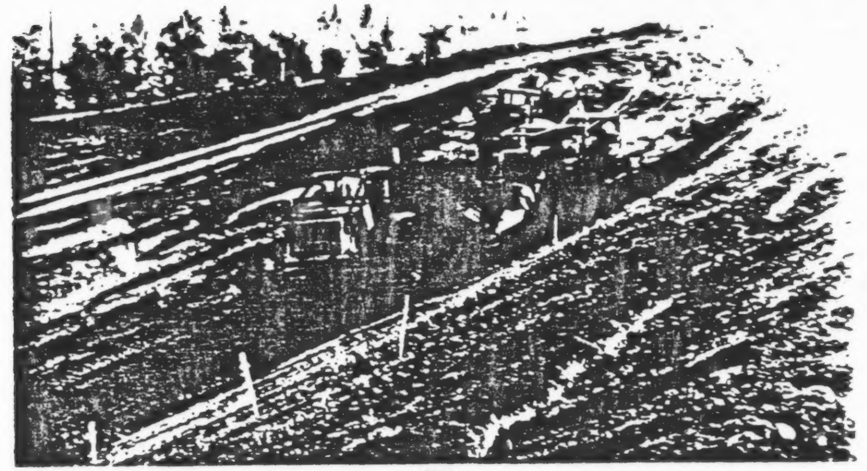
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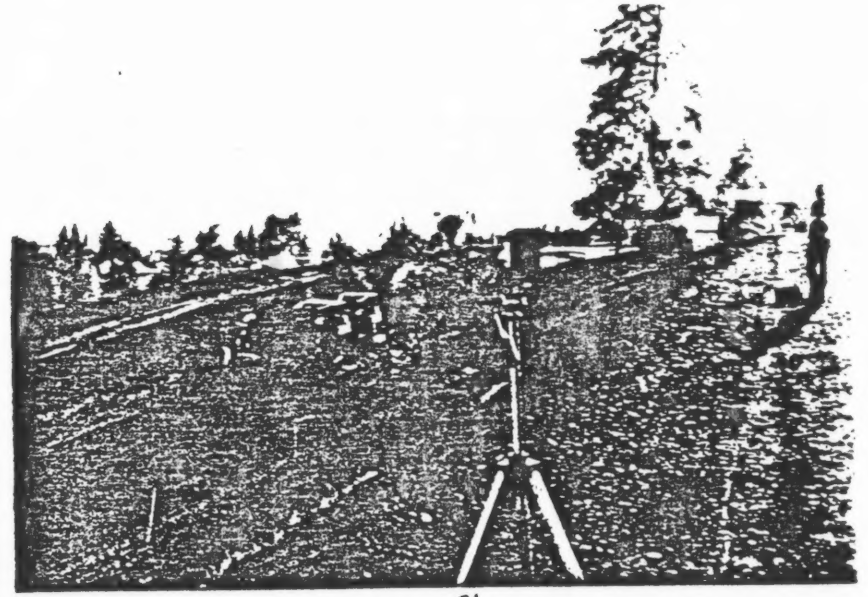
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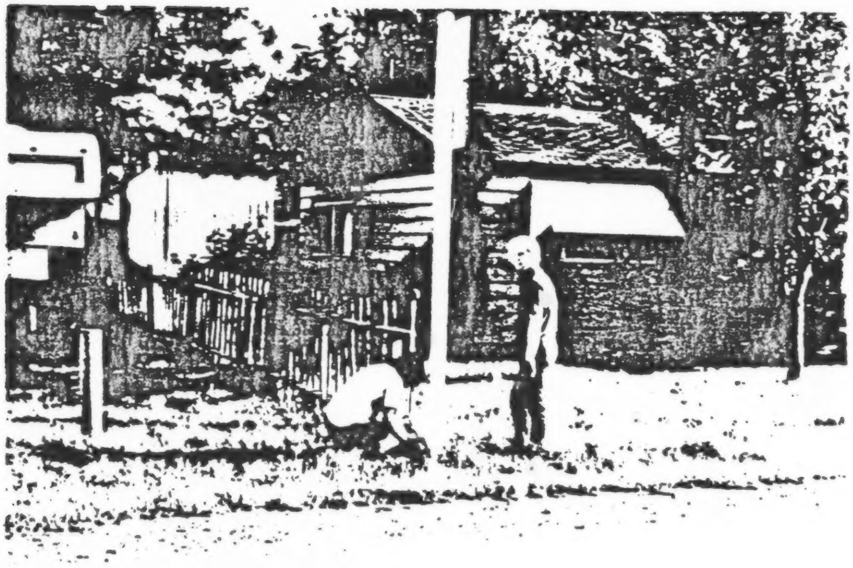

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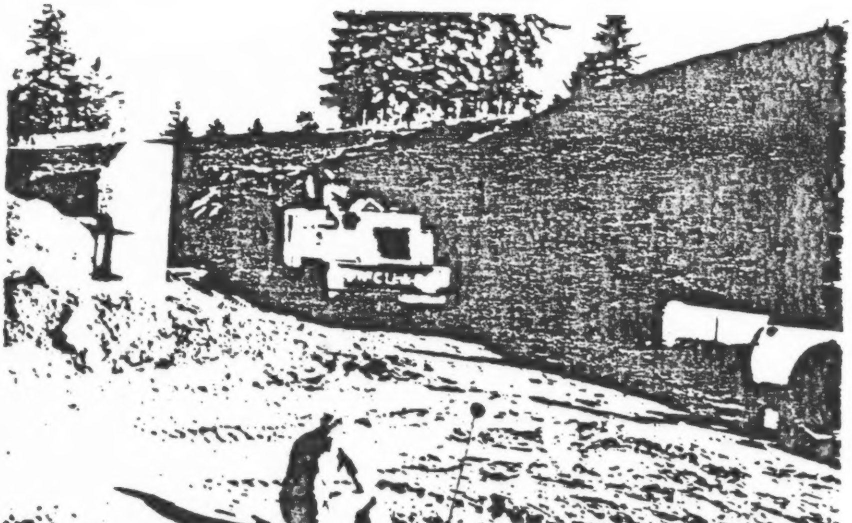

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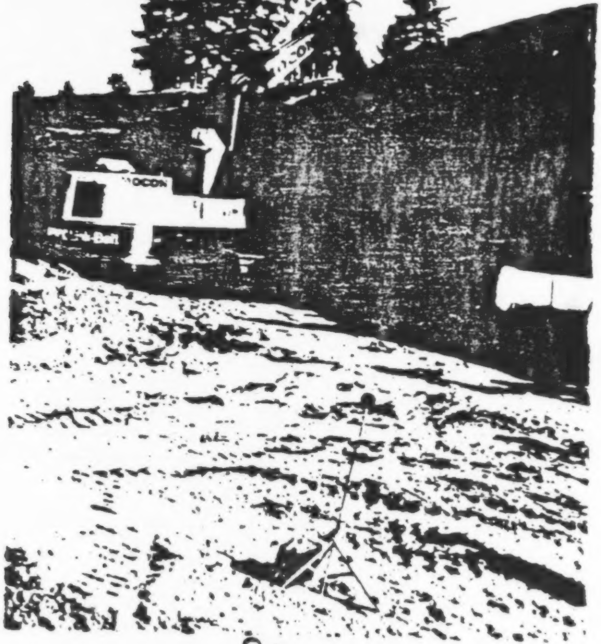

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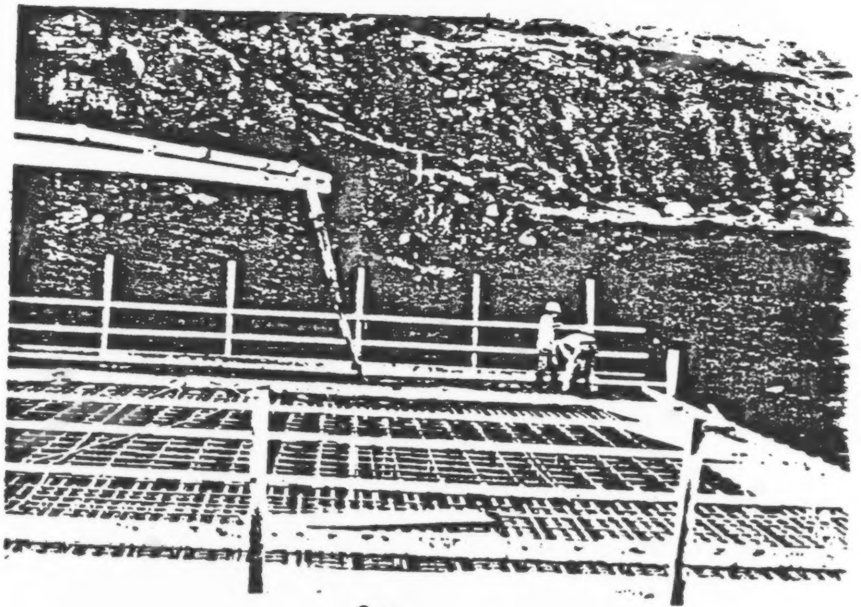

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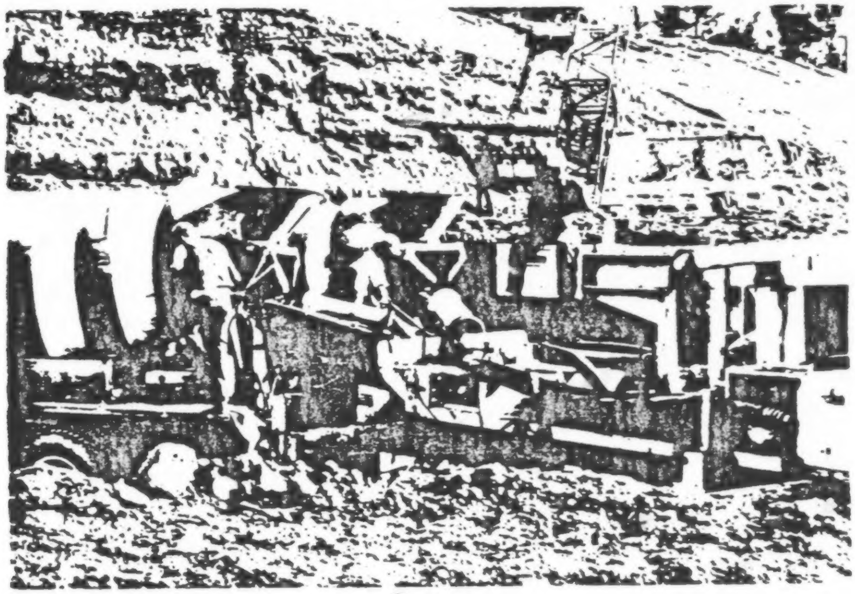

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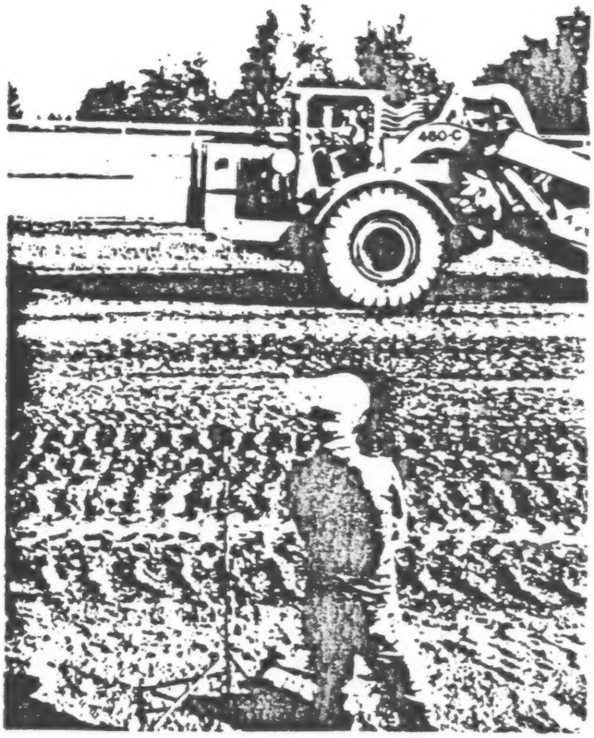

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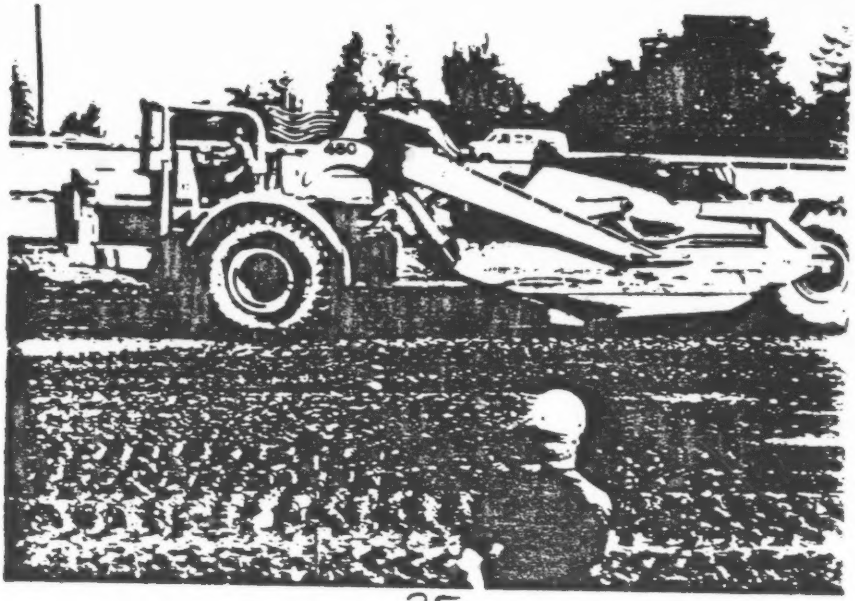

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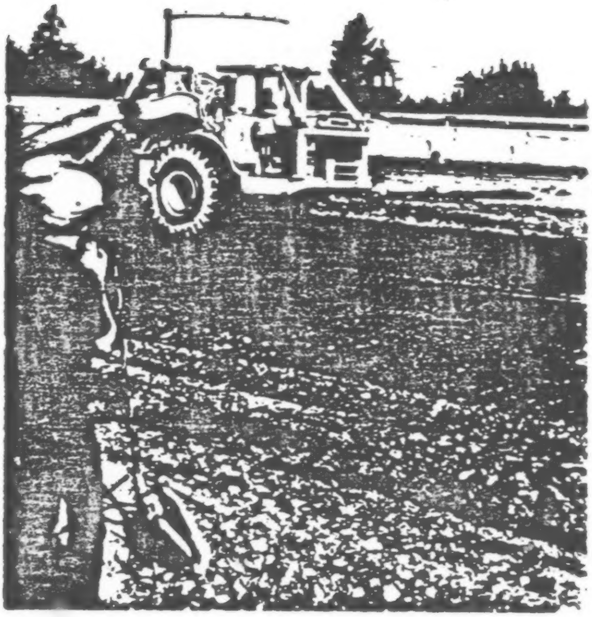

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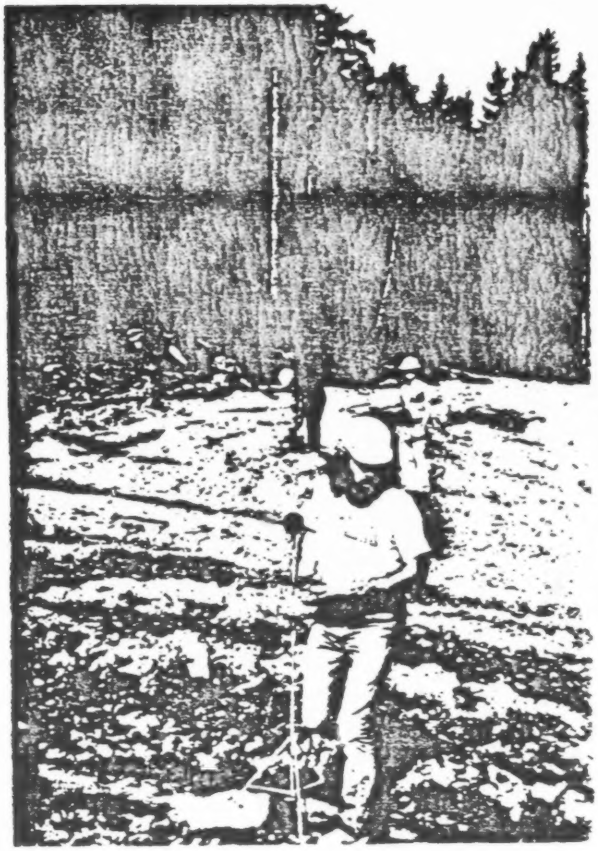

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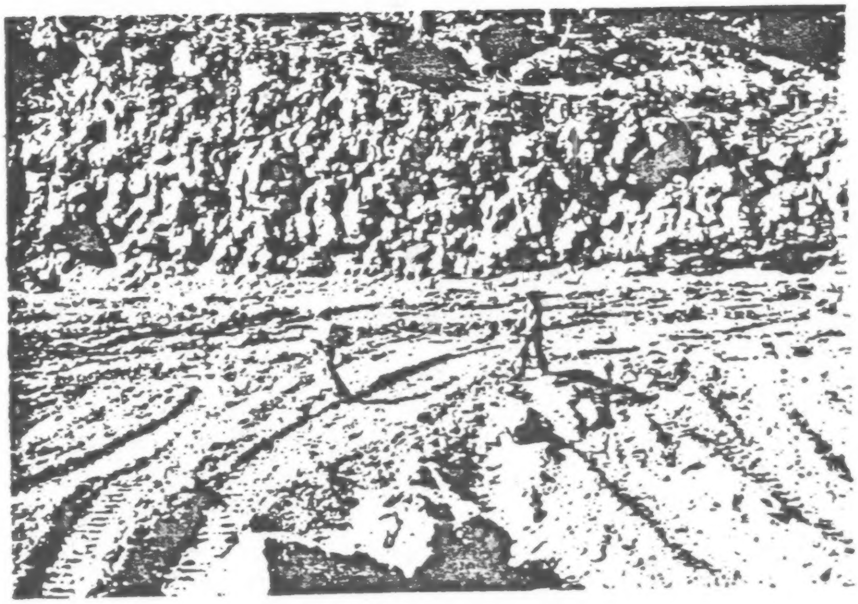

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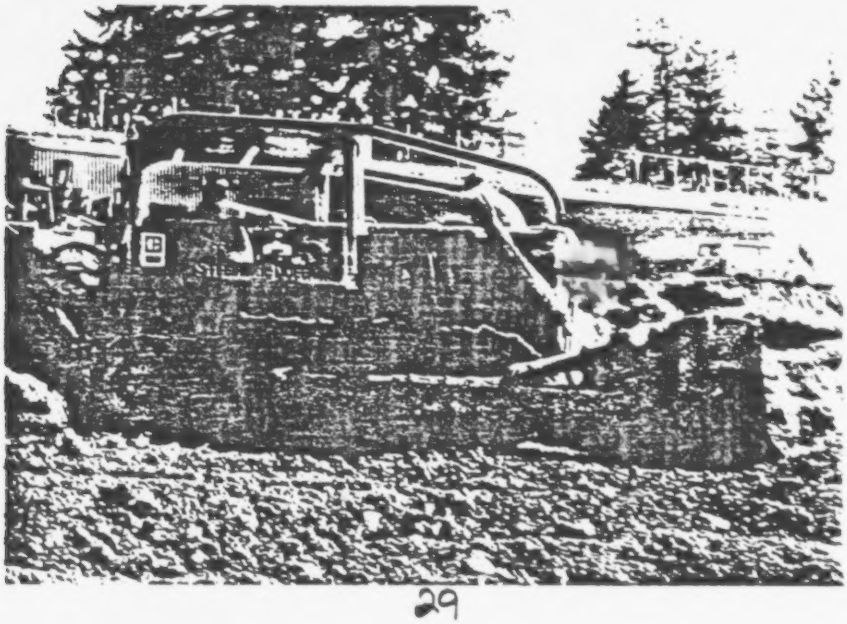

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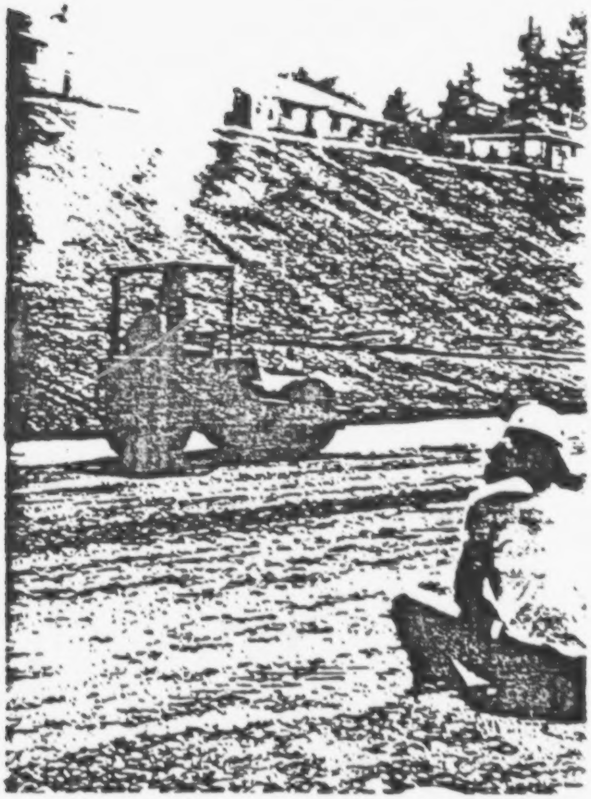

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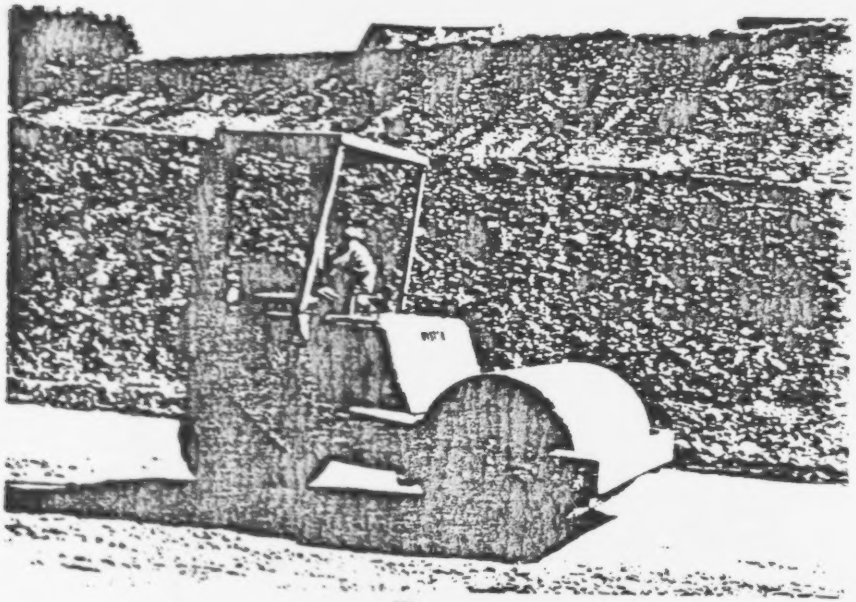

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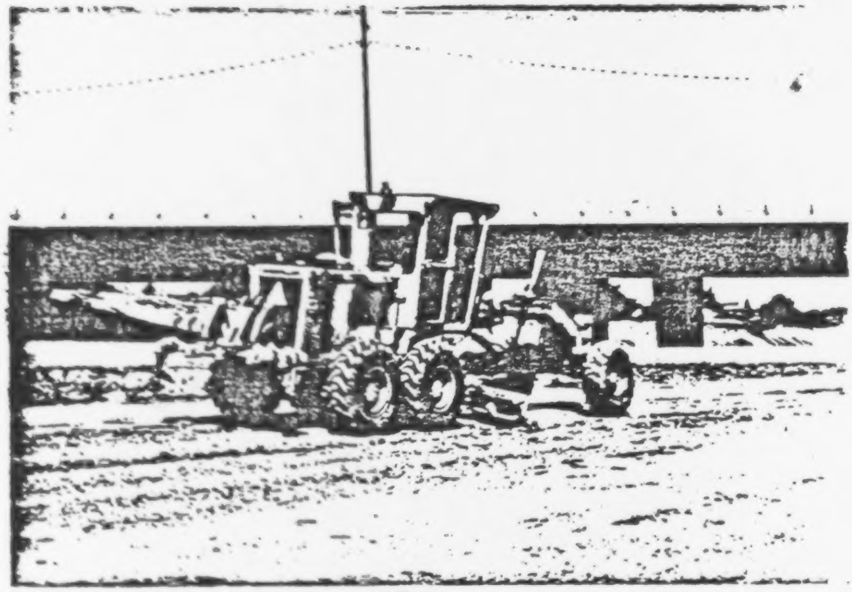

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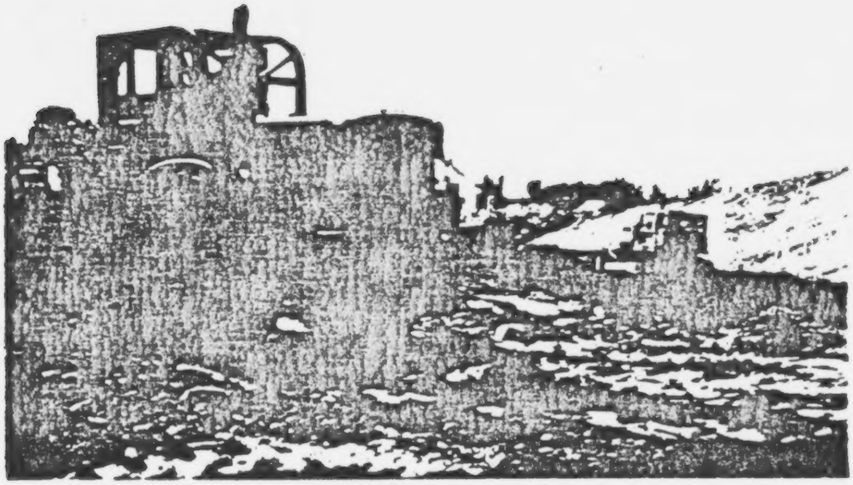

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KOLL T3

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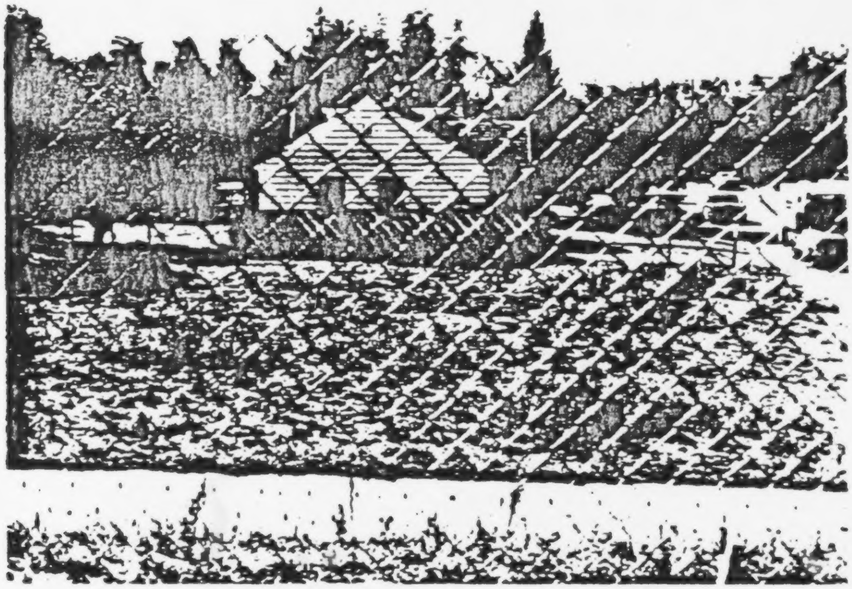

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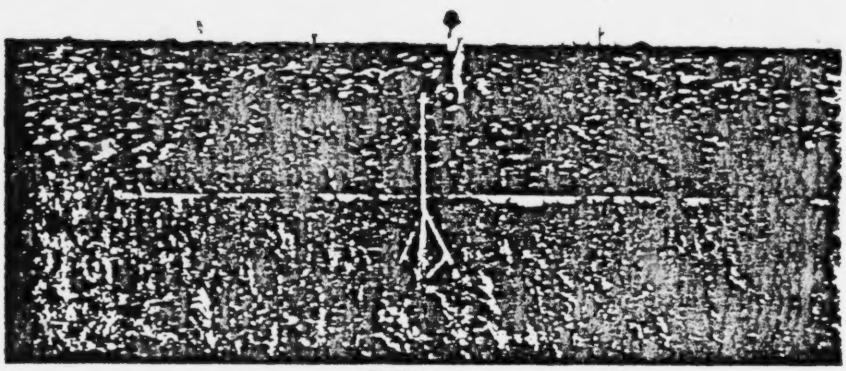

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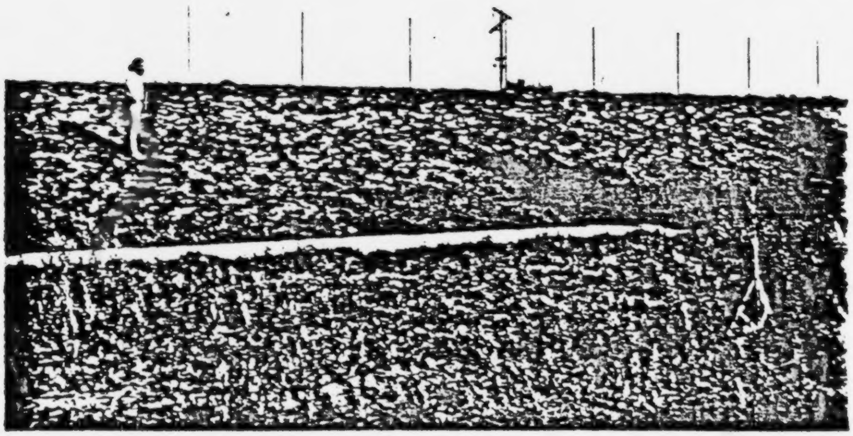

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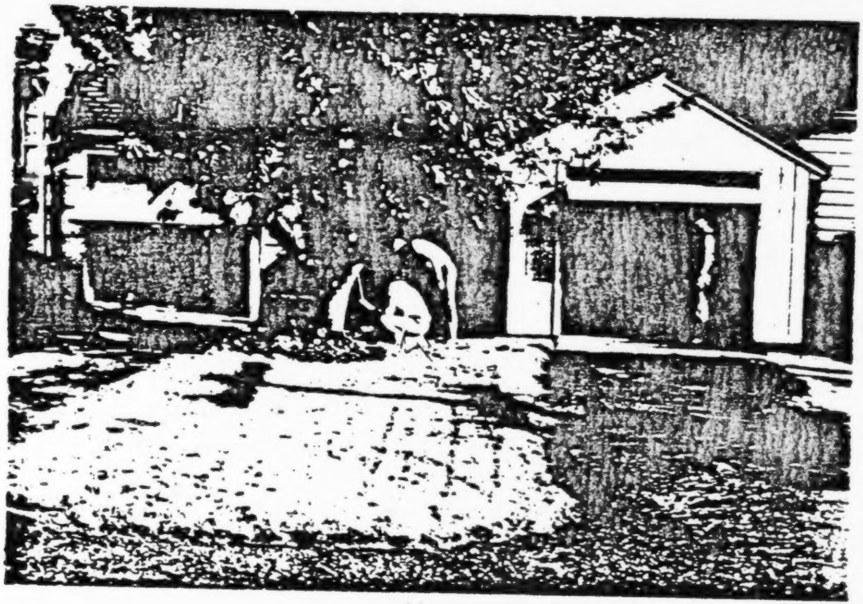

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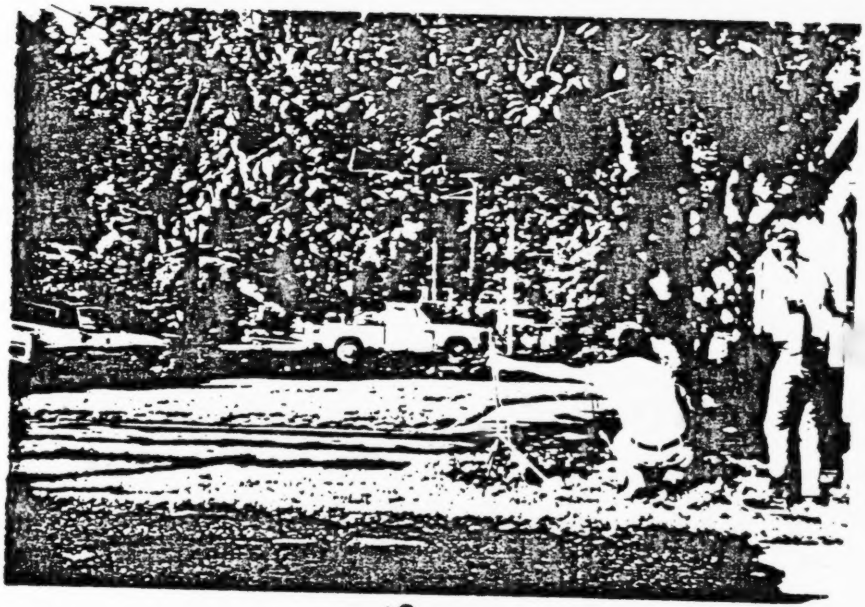

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